MARCH, 1953

TOOLING and PRODUCTION

The Magazine of Manufacturing Management

Automatic Die Designs:
STRIPPERS & GUIDES

•

CONVEYOR LINE DESIGN
for Small Parts Assembly

•

HIGHER CUTTING SPEEDS
Is the Sky the Limit?

•

Close-Tolerance
ALUMINUM STAMPINGS

•

HARDNESS TESTING
Equipment & Methods

•

HORIZONTAL PRESS
Production of Steel
Cartridge Cases

•

CEMENTED CARBIDES
Development & Application

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Problems in
PLANT ENGINEERING

•

NEWS OF
People, Products,
Plants and Processes

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CCA

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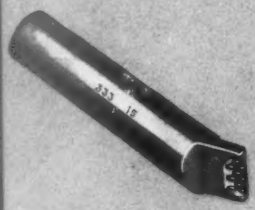
RADIUS FORMING TOOLS

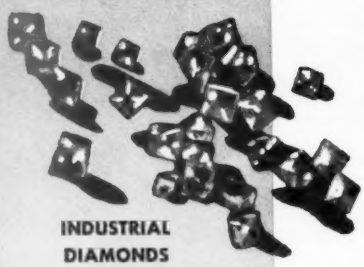


"TRU-LINE" PROFILE DRESSING TOOLS

IMPREGNATED DRESSING TOOLS

STANDARD DRESSING TOOLS

"TRU-THREAD" THREAD DRESSING TOOLS



INDUSTRIAL DIAMONDS

MULTI-DIAMOND TOOLS

"Sell it and make your fortune Mynheer Van Niekirk"

It was the year 1876. Free America was 100 years old and there were great celebrations in Philadelphia. In London, Queen Victoria was proclaimed Empress of India.

In South Africa, children playing by the Orange River found a bright pebble, too pretty to throw away, but when trader Van Niekirk offered to buy it they shouted with laughter and told him to sell it and make his fortune.

But, nobody wanted to buy the pebble so Van Niekirk dropped it in an envelope and mailed it to a government agent who declared it to be a diamond of 21 carats. Then, the governor of the Colony bought it for five hundred pounds and sent it to the Paris Exhibition as a curiosity.

Nobody paid much attention, but this was the first clue to the existence of the diamond fields that would one day pour out fabulous treasures in gems—and in industrial diamonds, those incomparable cutting points which do so much to increase production and reduce costs.

The diamond fields are but 75 years old, and for 43 of those years we have specialized in importing and selling industrial diamonds and manufacturing industrial diamond tools—engineered to your job and guaranteed to do it. Please write for our catalogs.

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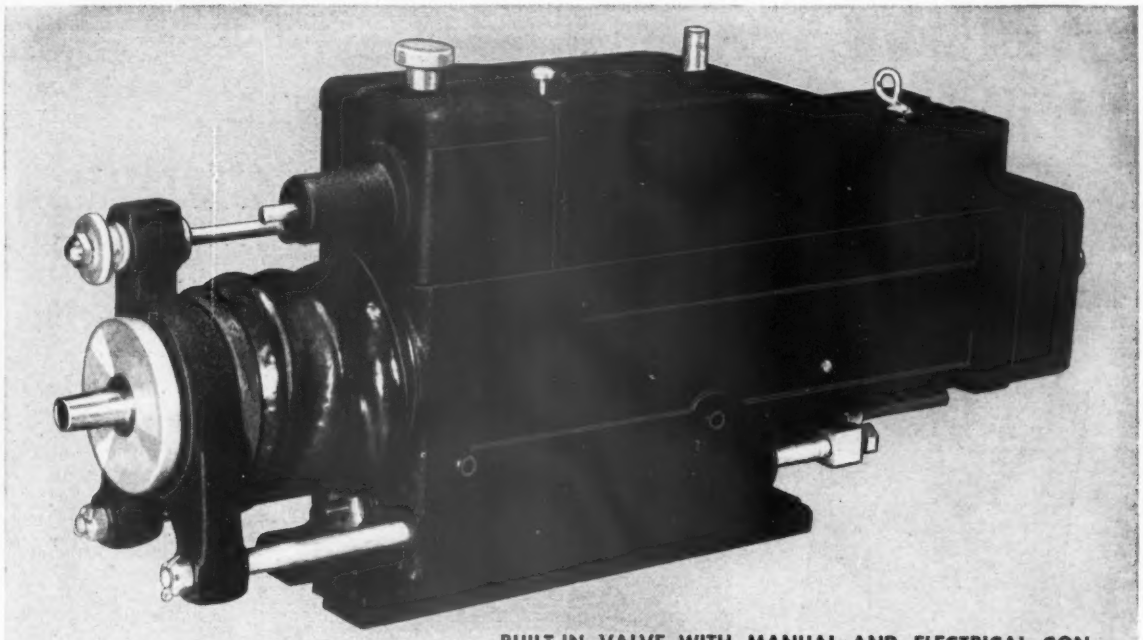
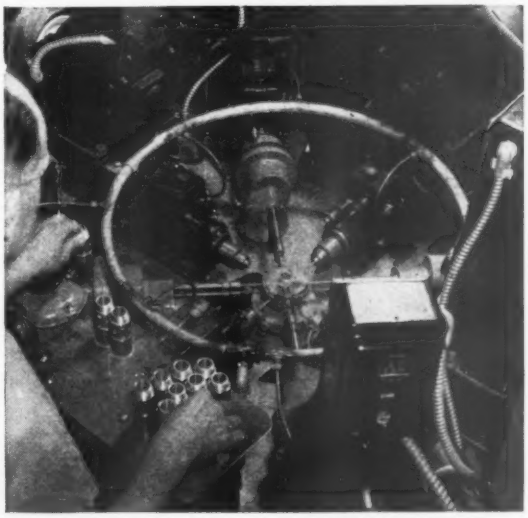
BELLOWS-LOCKE DRILL UNIT COMBINES HYDRAULIC FEED, AIR-POWERED TRAVERSE, ELECTRICALLY DRIVEN SPINDLE



BUILT-IN VALVE WITH MANUAL AND ELECTRICAL CONTROLS, RUGGEDNESS AND COMPACTNESS FEATURE NEW ¼" CAPACITY, 3" STROKE DRILL UNIT.

PRECISION adjustable hydraulic controlled feed rate, coupled with rapid air-powered advance and retract, and a full 3" drilling stroke, make the Bellows-Locke Drill Unit an important component in tool-room-built special purpose machines. Feed rate is infinitely adjustable from 0" per minute up to the maximum speed of the air-powered movement as determined by the air line pressure used.



This special purpose machine at The Perry-Fay Co., Elyria, Ohio, uses 8 Bellows-Locke Drill Units to drill twelve 7/32" holes in less than 1-1/2 seconds.

The Bellows-Locke Drill Unit can be mounted horizontally, vertically, or at any angle. Its small size (21-1/16" long by 3¼" wide by 7-11/16" high) lends itself to space saving design. Used with a 1750 RPM motor, spindle speed range is adjustable from 690 to 4630 RPM through the Bellows Speed-Selector Pulley. (Motor and Speed Selector Pulley are optional.)

As standard, the unit is equipped with built-in directional air valve with built-in solenoid, as well as manual start and stop controls. It is available with optional electric controls to provide deep hole drilling with automatic drill cleaning, or time controlled dwell. The Bellows-Locke Drill Unit can be factory equipped with any standard tapping head.

The Bellows Co.

AKRON, OHIO

See your local Bellows Field Engineer or write direct for a copy of the Bellows-Locke Bulletin. Address Dept. TP353, The Bellows Co., Akron, Ohio. In Canada: Bellows Pneumatic Devices of Canada, Ltd., 4972 Dundas St. W., Toronto 18, Ontario.

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

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the 1953
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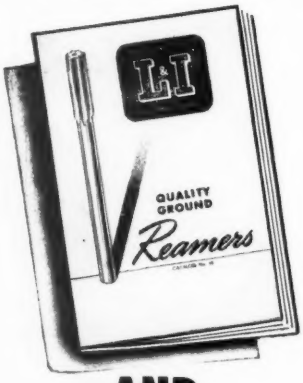

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TOOLING and PRODUCTION
The Magazine of Manufacturing Management

Vol. VXIII, No. 12 MARCH, 1953

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They have the influence that enables them to adopt the ideas and the processes which TOOLING and PRODUCTION describes in every issue AND the authority to recommend, to specify and/or to buy everything that may be needed to reduce costs, increase production or improve quality. These men for whom, each month, our editors seek out or write TOOLING and PRODUCTION'S meticulously accurate stories of "Know-How" and "Tell-How" are T & P's exclusive Cycle of Buying Influence (CBI) in their plants.

Every copy is directed to these men by name, by title and by company address. Please see our CCA verification.

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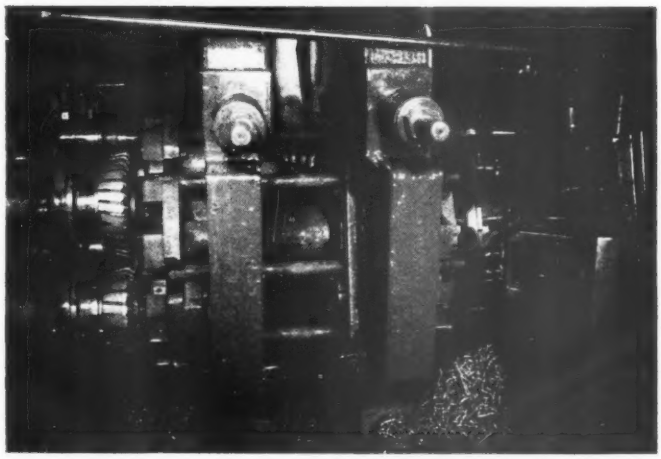

HERE'S AN OUTSTANDING EXAMPLE IN THE AUTOMOTIVE INDUSTRY

ACTUAL JOB	AUTOMOTIVE PLANT
Machine	Davis Thompson Milling Machine
Part	Rear axle shaft
Operation	Rough and finish mill spline end
Material	S.A.E. 1038—Brinell Hardness 179-229
Tools	Wesson 6" and 8" dia. Milling Cutters—fine pitch—braze type
Speed	8"—387 S.F.M. 6"—290 S.F.M.
Feed	14" per min. Feed per tooth 8" dia. (28 teeth) .0021 Feed per tooth 6" dia. (20 teeth) .0030
Production	150 pcs. per hour, 1500-1700 pcs. per grind
Grade of Carbide	Wessonmetal WM

Write for . . . the story of Carbide

THIS CARBIDE AGE

WESSON METAL CORPORATION
LEXINGTON, KENTUCKY
Affiliated with WESSON COMPANY, Detroit, Mich.

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and improved product with this

CINCINNATI
Press Brake

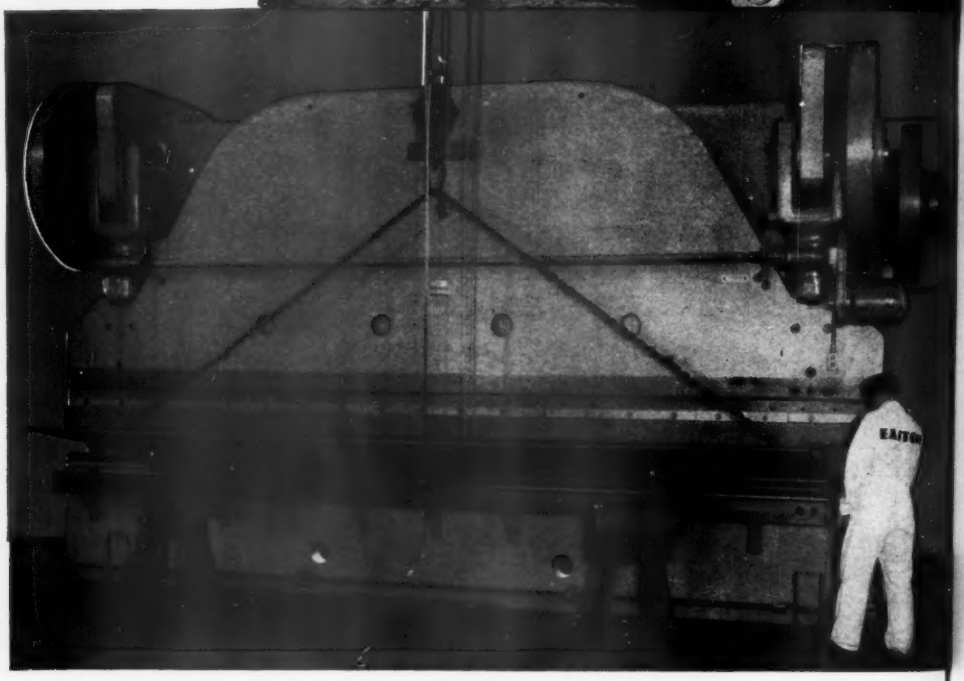

Illustration courtesy Easton Car & Construction Company, Easton, Pennsylvania.

Here a Cincinnati Press Brake is forming ½" plate for wide sections of off-highway trailers, at the Easton Car & Construction Company, makers of a large line of products for industrial transportation.

By using this Cincinnati Press Brake, some welding operations were eliminated, which improved the product, and reduced production costs at the same time.

The power, accuracy, and versatility of Cincinnati Press Brakes are reducing manufacturing costs where ever they are installed. If you form, or bend, you should investigate their possibilities.

Write for Press Brake Catalog B-3.

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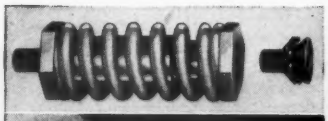
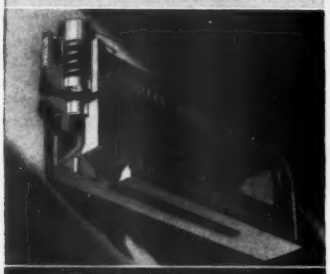
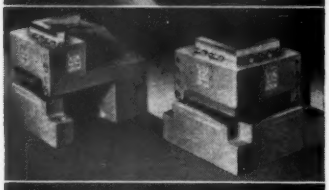
WHAT WALES LEADERSHIP THROUGH CONTINUING RESEARCH and DEVELOPMENT *means to you*



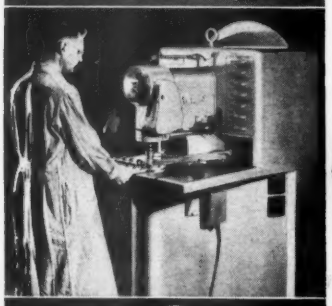
1928



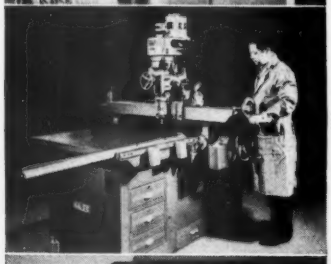
1932



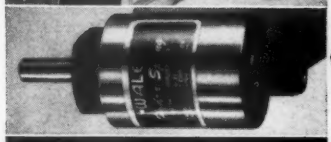
1936



1943



1946



1951

1952

?

195–

1928 WALES *Strippits* revolutionize die making by providing a spring held compressed by a retainer to standardize stripping pressures.

1932 WALES *Self-Contained Hole Punching Units* incorporate the basic Strippit principle to provide free-floating punch and guide for independent design.

1936 WALES *Self-Contained Notching Units* are an outgrowth of the successful applications of Wales Hole Punching Units and Wales Strippits.

1943 WALES *Fabricators* provide rapid interchangeability for punching, notching and nibbling . . . no templates required. Work from prints or operation sheets.

1946 WALES *Drilling Machines* are designed to meet precision requirements of locating, drilling, boring and reaming holes . . . no other drilling machine or jig borer like it.

1951 WALES *Hydra Springs* utilize the compressibility of Wales Comproils to provide up to 600% more pressure than conventional springs.

1952 WALES *Hydra-Strip Hole Punching Units* with built-in Wales Hydra Springs permit these self-contained Units to punch and strip material up to 3/4" thick.

● This chronological array of Wales patented equipment is only a partial list of the numerous exclusive products developed through years of research by Wales Engineers.

That is one of many reasons why thousands of manufacturers have made it a standard practice rule to standardize on Wales developments. You, too, will be years ahead in time-saving, money-saving production techniques by putting Wales Equipment to work in your plant.

To assist you, Wales Sales Engineers are strategically located throughout the country. These engineers are more than just "factory trained" . . . they have been employed by this Corporation for years before servicing prospects and customers.

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Specialists in Punching and Notching Equipment

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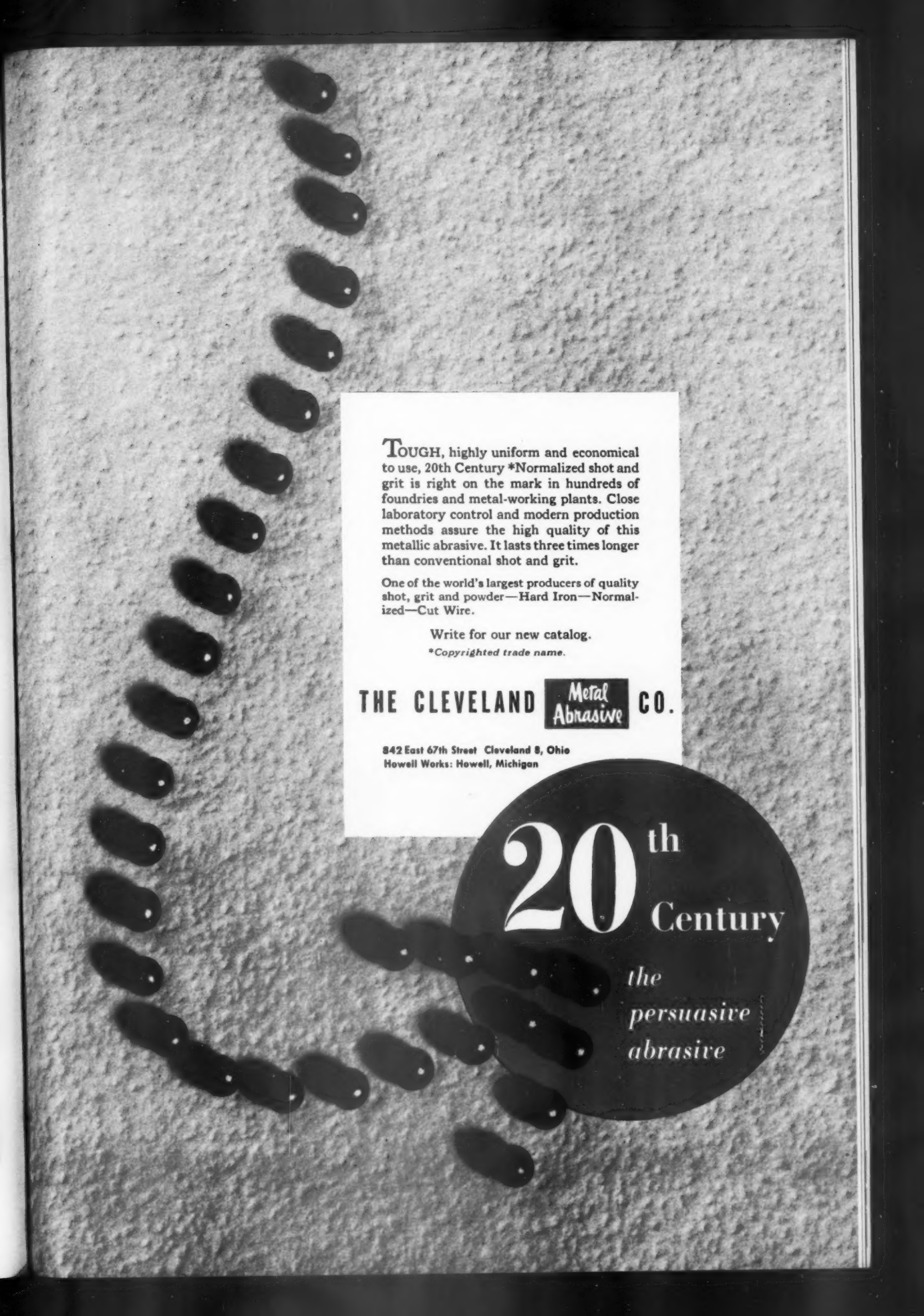
TOUGH, highly uniform and economical to use, 20th Century *Normalized shot and grit is right on the mark in hundreds of foundries and metal-working plants. Close laboratory control and modern production methods assure the high quality of this metallic abrasive. It lasts three times longer than conventional shot and grit.
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20th Century
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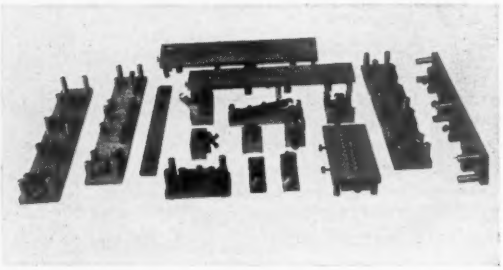
YOU GET *SPEED* PLUS ACCURACY WITH MOORE JIG BORERS

IN THE TOOLROOM

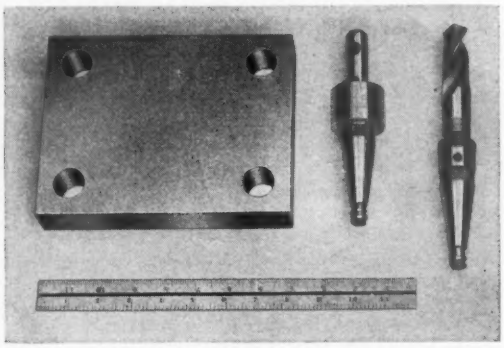
400 holes to "tenths"—5 to 7 minutes each on the No. 1 Moore Jig Borer



Manufacture of this group of drill jigs involves accurately locating, drilling and boring approximately 400 holes. The No. 1 Moore Jig Borer finished them to "tenths" in from five to seven minutes per hole.

ON PRODUCTION

64 holes to ±.0002"—2 minutes each on the No. 2 Moore Jig Borer



Sixteen pieces like this were located, drilled, bored and checked on a No. 2 Moore Jig Borer with one drill and one carbide bit. The 64 holes were finished in 2 hours and 8 minutes (plus 30 minutes setup) with location and size tolerances ± .0002".

Only a precision machine geared to the high American production standards of ruggedness *and* accuracy can meet these performance requirements. For versatility and speed in spotting, drilling, reaming, boring and checking operations in production as well as tooling, no other moderately-priced machine tool compares with the Moore Jig Borer. And there's no sacrifice of accuracy for speed, since the lead screw measuring system built into each Moore machine permits working to the closest of tolerances.

You'll find that the Moore Jig Borer can pay for itself—*in jig time.* Write today for detailed bulletins.

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726 Union Avenue, Bridgeport 7, Conn.

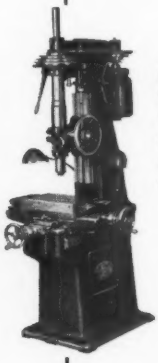

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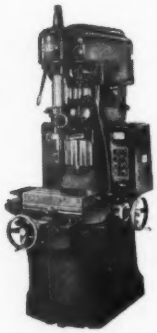
Table working surface of 10"x16". Over 1200 now in use throughout the world. The ideal small, accurate jig borer. Lead screws accurate to .0002" in 16".



NO. 2 MOORE JIG BORER
Table working surface of 10"x19". Heavier cuts, larger holes. Features infinitely variable spindle speeds, three power feed ratios, centralized control panel.

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2,537,517

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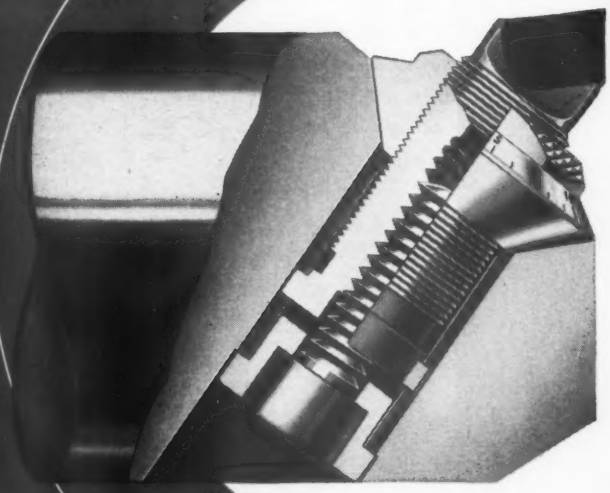
for Precision Boring, Turning and Facing Operations!



fast dependable adjustment by proven micrometer, vernier principle.

Maximum rigidity for the efficient application of carbides.

Production Applications: A complete service is available for engineering and manufacturing Microbore Equipment for production operations.

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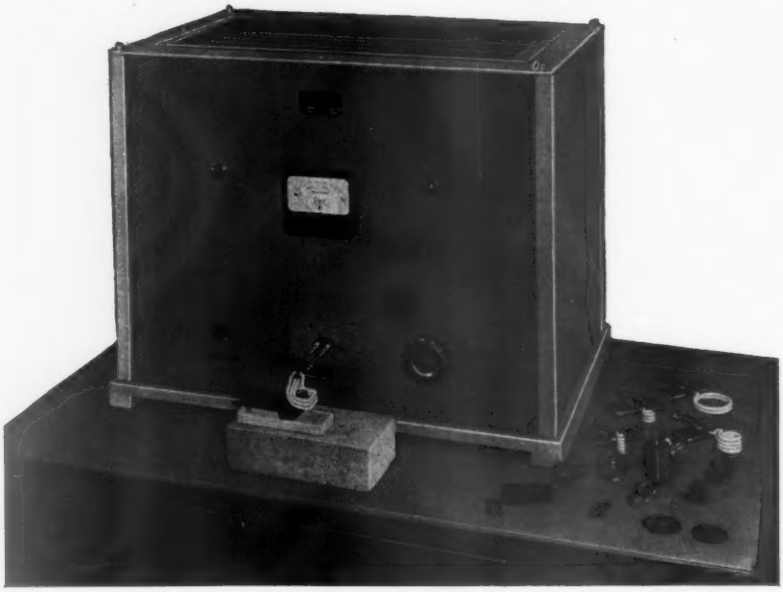
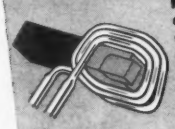
A *Low Cost* PORTABLE HIGH FREQUENCY *Induction* HEATING UNIT

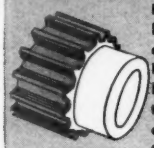


BRAZING



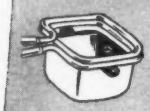
Permits widest choice of silver or copper brazing alloys from lowest to highest melting points. Ideal for brazing carbide tips.

HARDENING



Heat localized exactly where wanted at desired temperature. Ideal for gears, cams, bearing surfaces, cutting tools and other areas that are subject to wear.

SOLDERING

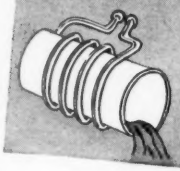


Speedily and neatly performs intricate soldering applications with or without the use of pre-formed rings.

ANNEALING

Ideal for annealing, stress-relieving, normalizing or preheating selected areas.

MELTING



Readily melts quantities of ferrous and non-ferrous metals in either graphite or ceramic crucibles.

- **SMALL AND COMPACT** Conveniently operated on bench or table—no mounting necessary.
- **ECONOMICAL OPERATION** No special power installation required. Operates on 110 volts, 60 or 50 cycle line at unity power factor.
- **FULLY GUARANTEED** Guaranteed for continuous duty cycle and stated performance.

This versatile unit is priced so low that every shop may now take advantage of modern induction heating techniques to improve quality and to increase production. Its simplicity of operation eliminates the need for skilled personnel.

The Lepel Model 2 KW will meet the requirements of machine shops, toolrooms, research laboratories and educational institutions. It is especially suitable for hardening, brazing and soldering small parts of either ferrous or non-ferrous metals.

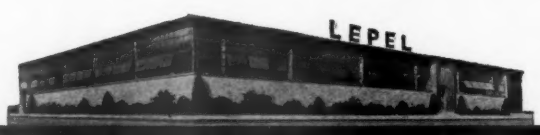
Complete unit with line connection and load coil.

$870.
f.o.b. factory

WILL HEAT TO 1500° F.

⅛"	steel	rod	1"	length	in	approx.	1 second
¼"	"	"	"	"	"	"	3 seconds
½"	"	"	"	"	"	"	15 seconds
1"	"	"	"	"	"	"	60 seconds

Will melt 4 ounces of brass or steel in 4 minutes.
Equally well suited for heating of non-ferrous metals.



LEPEL HIGH FREQUENCY LABORATORIES, INC.
55th STREET and 37th AVENUE, WOODSIDE 77, NEW YORK CITY, N. Y.

All Lepel equipment is certified to comply with the requirements of the Federal Communications Commission.

WRITE FOR LEPEL CATALOG TD-1

Automatic Recessing

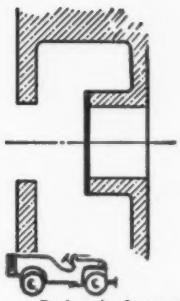
the "Know-How" of grooving

Wherever grooves, faces, chamfers, etc. are cut—whether internal or external—toward production, reduces costs on long runs.

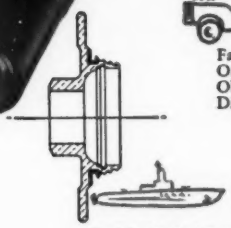
with SJ SCULLY-JONES

AUTOMATIC RECESSING TOOLS

They do these operations on standard drill presses, radial drills, turret lathes and chucking machines, as well as on special machines. A single recessing tool is easily adapted to do various operations or a combination of operations. Adjustments regulating location and depth of groove are simple, fast and accurate. Types "J" and "C" pilot in a fixture bushing. Type "R" pilots in, and stops on the work.



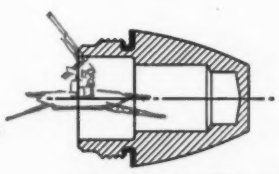
Facing An Internal Boss On Motor Castings Where Obstruction Usually Causes Difficulty.



Both Inside And Outside Clearance Grooves Cut In One Operation On Oil Tank Caps For Submarines.

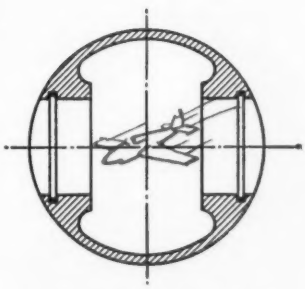
TYPICAL RECESSING-TOOL OPERATIONS

Formed Recesses Made In One Operation On Detonator Bushings Of Large Calibre Motorized Artillery Rifles.



Groove For Thread Clearance Cut On Anti-Aircraft Projectile With Automatic "Necking" Tool.

Casting Of Part For Army Tank On Which Two Recesses Are Made At One Time.



Snap-Ring Grooves Cut In Wrist Pin Hole Of Airplane Pistons.

Scully-Jones AND COMPANY

WRITE FOR BULLETIN No. 10-50
showing types, sizes, specifications and prices.

1913 S. ROCKWELL ST., CHICAGO 8, ILLINOIS

YOU GET LOW COST, FAST, ACCURATE PRODUCTION WITH OUR STANDARD AND SPECIAL TOOLS

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

Croblox

(CHROME CARBIDE)

It's New!

Superior Corrosion Resistance!

Expansion Similar to Steel!

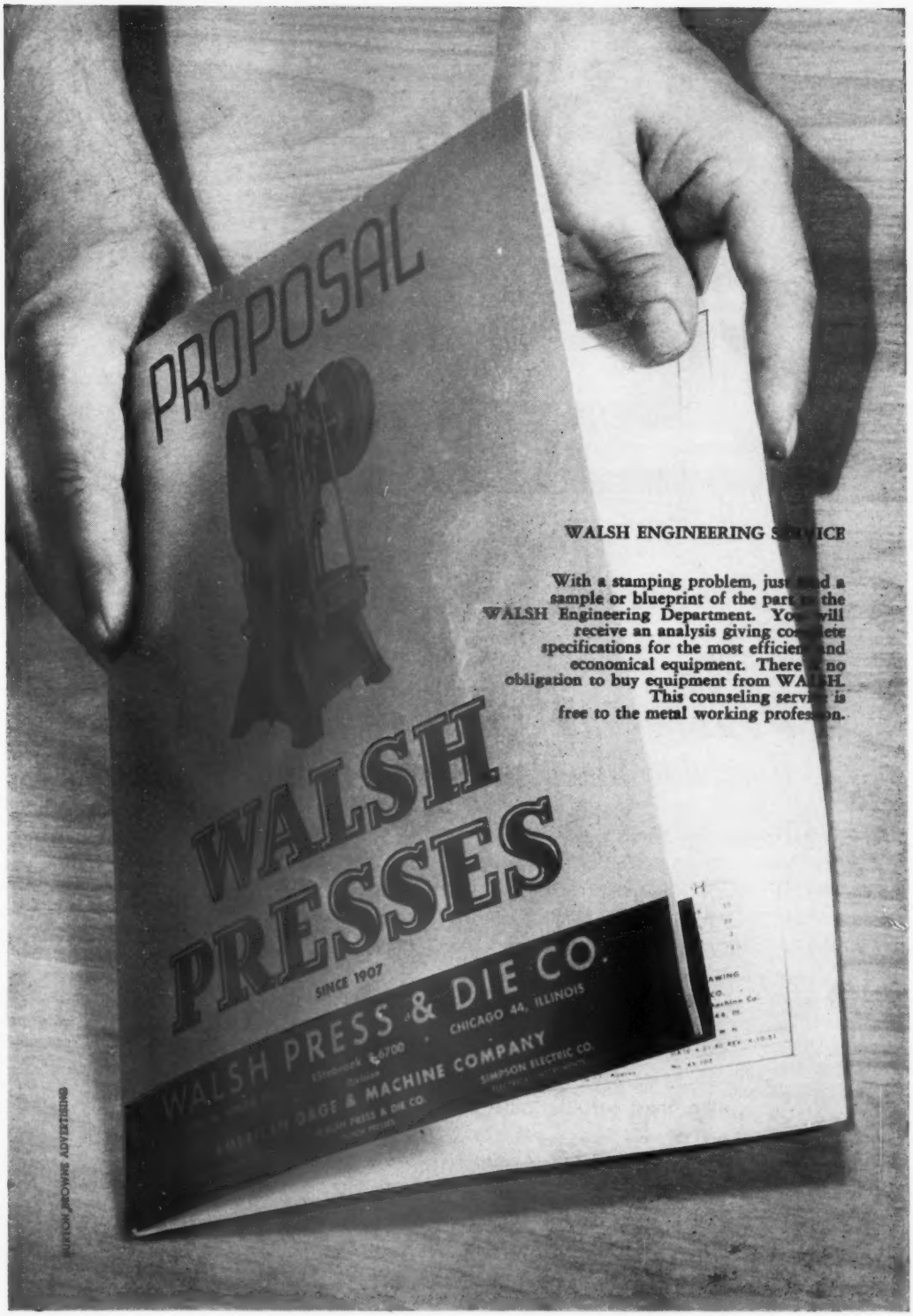
WRITE FOR FOLDER

Webber

GAGE BLOCKS

Largest exclusive manufacturer of gage blocks

WEBBER GAGE COMPANY
12903 Triskett Road, Cleveland 11, Ohio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WALSH ENGINEERING SERVICE
With a stamping problem, just send a sample or blueprint of the part to the WALSH Engineering Department. You will receive an analysis giving complete specifications for the most efficient and economical equipment. There is no obligation to buy equipment from WALSH. This counseling service is free to the metal working profession.
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SINCE 1907
WALSH PRESS & DIE CO.
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AMERICAN GAGE & MACHINE COMPANY
SIMPSON ELECTRIC CO.
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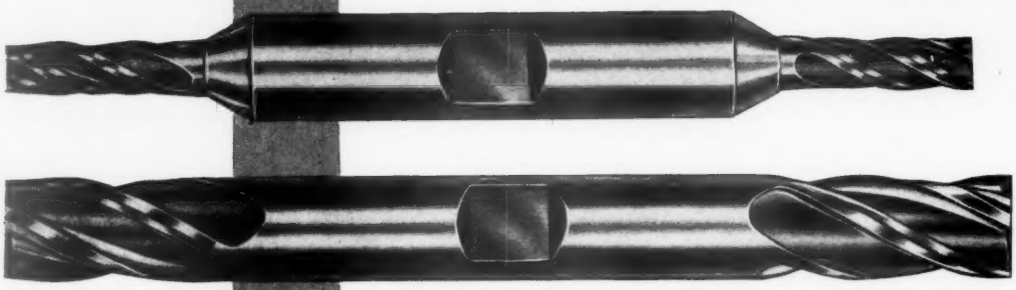
Another Quality Engineered

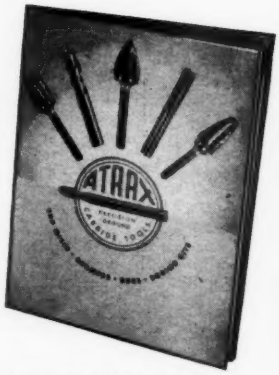
ATRAX TOOL



Double-End Carbide End Mills
Precision Machine Ground-from-the-Solid

1. Shanks flatted for set screw.
2. Cutter 1/8" to 9/32" diameter of brazed inserted type construction—prevents loosening or separating from steel body, a hazard of conventional built brazed construction.
3. Cutter 5/16" to 1/2" diameter of solid carbide throughout —adding rigidity and strength for extra heavy cuts.
4. Backed by the Atrax quality reputation— the finest carbide tools of this type.
5. Available in 2 and 4 Spiral Flutes.

Representatives and Distributors in principal cities in United States and Canada. Write for name of representative in your area.



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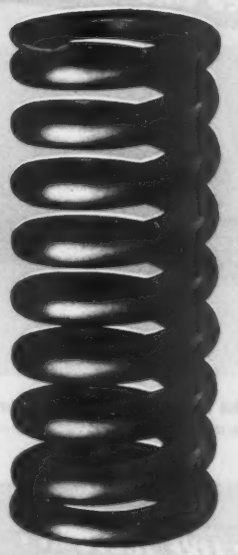
Don't risk DIE BREAKAGE!

Specify PRODUCTO ACCESSORIES



High-Pressure Springs made of Chrome-Vanadium Steel

Dowel Pins Accurately Ground for Precision Dies

If an inferior spring breaks . . . it might mean trouble during the stamping operations and could possibly cause a several thousand dollar die to be damaged. More than that, losses pile up as press down-time and maintenance costs climb.

Protect the big investment, the die itself . . . buy only *quality* die accessories. Call your nearest Producto representative or branch for prompt service. Directory listings are found in all principal stamping centers.

Check List of Producto Die Makers' Accessories

High Pressure Springs	Die Rubber
Square Wire Springs	Dowel Pins
Medium Pressure Springs	Stripper Bolts
Guide Pins and Bushings	Cap Screws

THE PRODUCTO MACHINE COMPANY
970 Housatonic Ave., Bridgeport 1, Connecticut

For Die Accessories *Fast*, Call . . .

PRODUCTO

MAKERS OF DIE SETS, PRESS FEEDS, VISES, TOOL ROOM EQUIPMENT

NOW you can make special and production gages using your

GAGE BLOCKS with new DoALL MICRO-STEP GAGING SYSTEM

HERE, for the first time is the means for directly applying gage blocks to thousands of precision measurement jobs which previously could be checked only with less accurate gaging setups.

—the means for securing micro-inch accuracy on *inside* as well as outside measurements.

—the means for assembling *gage-block* gages of every conceivable type, including gages up to 72″ long.

—the means for making pin gages, snap gages, indicating gages, height gages, depth gages, go and no-go gages for use not only in the lab, but in the toolroom and shop as well.

Here, in short, is a practical, economical means of securing superior dimensional quality control, of reducing rejects and wasted time, material and money.

Key to the system are the new DoALL Gage Holders and gage block-accurate End Standards with full exposed measuring surfaces. No other gage system offers such a combination.

For complete details, call your local DoALL Sales-Service Store, or write:

THE DoALL COMPANY

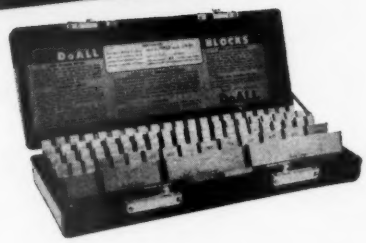
254 N. Laurel Ave., Des Plaines, Illinois

DoALL

ASK FOR NEW CATALOG

New Catalog describing the DoALL Micro-Step Gaging System in detail, lists all gage block, end standard and holder sets. Free on request.

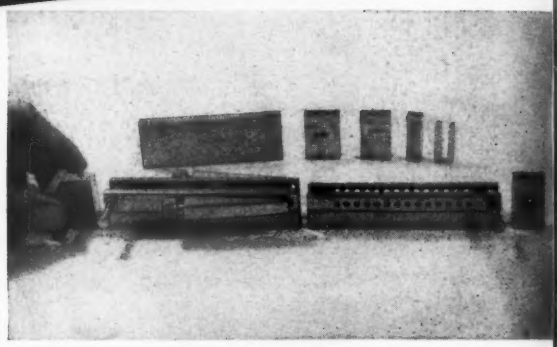
WITH THESE COMPONENTS . . .



DoALL BLOCKS

Accuracy second to none in the world. Most complete line of sets available, 6 to 118 pieces, including a new set having gage blocks up to 20.000″ long.

QUICKLY ASSEMBLED LIKE THIS . . .



1. Select the holder, end standards and gage block combination for any gage you need.

2. sta

YOU MAKE GAGES LIKE THESE . . .

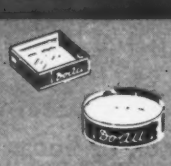
Internal gage-block gage calibrating indicating snap gage.

Assembled height gage for checking milling cutter setting.

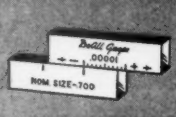
Height gage with scriber and standard for layout work.

Internal pin gage parts in

Monolite

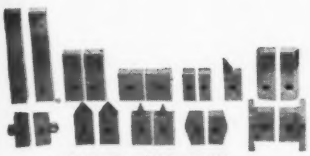


Optical Flats



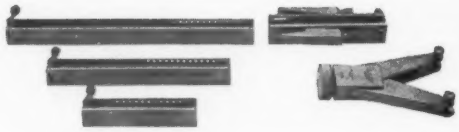
Vernier Gage Blocks

Sine Bars and Plates



NEW DoALL END STANDARDS

Here are gage block-accurate End Standards with fully exposed measuring surfaces which, when used with DoALL Gage Holders, make possible *gage-block gages* for every internal or external measuring job.

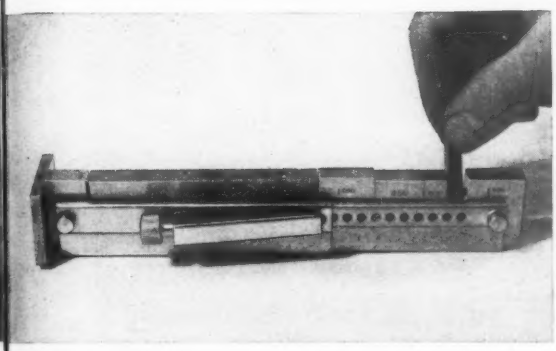


NEW DoALL GAGE HOLDERS

Channel-type holders available for making gages from 2" to 72" length. Quickly, easily assembled. Also a caliper holder for gages up to 6". For use only with DoALL End Standards and standard rectangular gage blocks.

NEW DoALL DIAL INDICATOR ASSEMBLIES

Here is the means of mounting dial indicators in any desired position in a DoALL Gage Holder to make indicating gages of all kinds.



2. Assemble holder, snap detent pins through end standards and insert correct gage block combination.

3. Press clamps into channel holes and tighten thumb screws snugly. That is all there is to it.

Internal indicating pin gage checking parts in the shop.

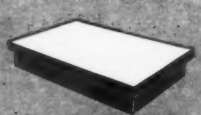
Pre-calibrated indicating comparator made with DoALL parts.

Micro-inch accurate indicating snap gage in use in the shop.

Go and no-go gage assembled with Micro-Step components.

This millionths-accurate indicating height gage is six feet long!

Bench Comparators



Granite Surface Plates

Mobile Inspection Unit

Gage Calibration Service

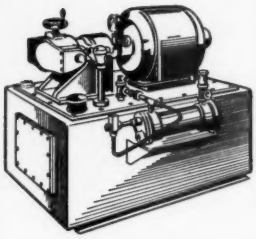
Gage Height Tables

Precision Measurement Text

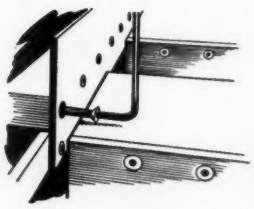
UNBRAKO FLAT HEAD SOCKET CAP SCREWS have the following features: heat treated alloy steel for strength; uniform 82° angle under head for maximum contact; accurate hex socket for positive, nonslip internal wrenching; fully formed threads—Class 3 fit; standard sizes—#4 to ¾"—in a full range of lengths.

Our Fiftieth Year

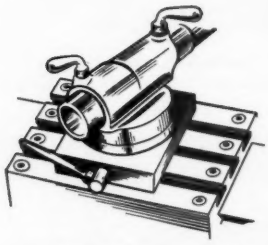
A START FOR THE FUTURE



USE UNBRAKO FLAT HEAD SOCKET CAP SCREWS for assembling thin section materials—on piston assemblies, electronic devices and radios.



On sheet metal parts, thin plates, strips and moldings.



On bench lathe milling attachments and other production machinery.

Why pay much more for a special fastener?

Why pay high prices for a special, when a standard UNBRAKO socket screw will do the job as well. Delivery of a standard is much better, because it is stocked by your local industrial distributor. Write for UNBRAKO Standards. SPS, Jenkintown 36, Pa.

Write for UNBRAKO Standards

UNBRAKO® SOCKET SCREW DIVISION

SPS JENKINTOWN PENNSYLVANIA

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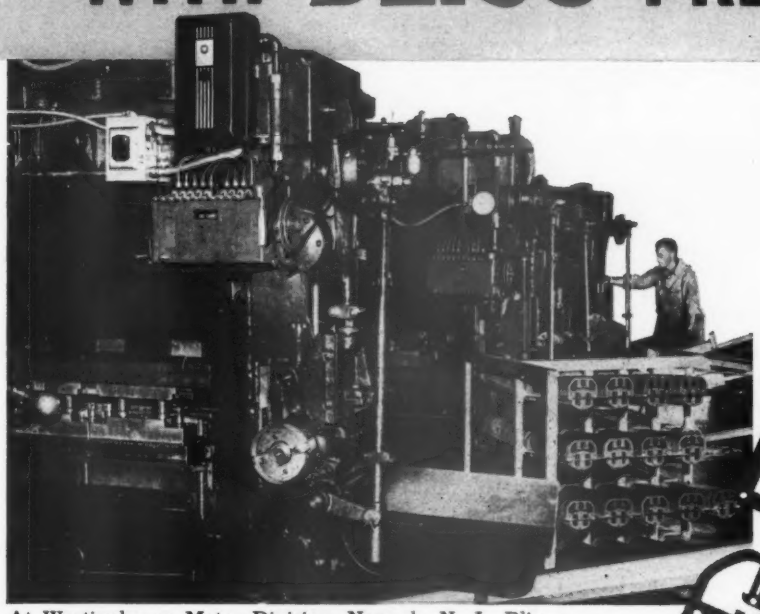
The trend is to more stampings WITH BLISS PRESSES...



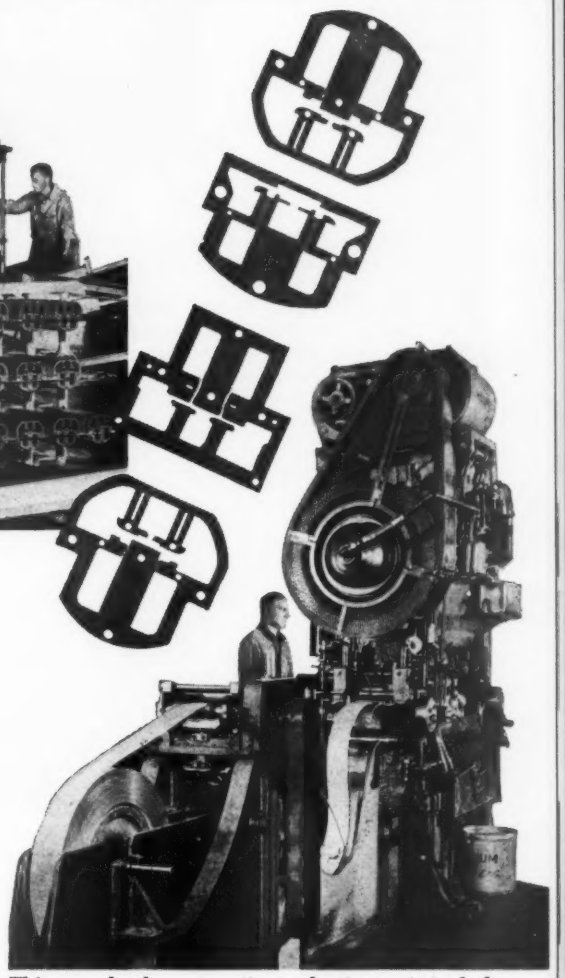
At Westinghouse Meter Division, Newark, N. J., Bliss Automatic Lamination line of four No. 645 High-Production Presses, operating at speeds in excess of 200 strokes per minute, steps up meter lamination production.

Westinghouse gets 800 laminations a minute from 4 BLISS Automatic Presses

To keep pace with stepped-up meter production, Westinghouse relies on a battery of four Bliss High-Production Presses for lamination stampings.

Production is fully automatic: 0.017 in. steel feeds from a Bliss-built coil cradle, through a double-roll feed into a six-station die. The stampings are stacked; the scrap is pulled through and trimmed...all at a rate of 200 strokes per minute.

These Bliss No. 645 Presses are but four of the 80 Bliss presses on the job at Westinghouse. That's because Bliss builds the most complete range of pressed-metal machinery available anywhere.



This completely automatic production unit includes coil cradle, roll straightener, double-roll feed, high-production shear and scrap press. For details on Bliss presses, write for "The Dominant Factor."

E. W. BLISS COMPANY, CANTON, OHIO

E. W. Bliss (England) Ltd., Derby, England

E. W. Bliss Company (Paris), St. Ouen sur Seine, France

PRESSES, ROLLING MILLS, SPECIAL MACHINERY

Branch offices in Chicago, Cleveland, Dayton, Detroit, Indianapolis, New Haven, New York, Philadelphia, Rochester, Toledo; and Toronto, Canada. **West Coast Representatives:** Moore Machinery Company, Los Angeles and San Francisco; Star Machinery Company, Seattle. **Other dealers** in U.S. cities and throughout the world.

BLISS

on your press is more than a name...it's a guarantee!

NOTE: ***This is the only grinder in its capacity range (longitudinal 24", transverse 8", vertical 12") with a vertical spindle grinding head.***

ABRASIVE No. M-34
VERTICAL SPINDLE
SURFACE GRINDER

Only one in it's class!

When the job calls for fast, low cost grinding of flat surfaces, it pays to schedule the work to the Abrasive No. M-34. This toolroom-sized surface grinder puts toolroom grinding on a production basis. Its 6" segmental-type grinding wheel, driven by the full power of a 5 HP built-in motor, permits fast removal of stock — produces ultra-fine surface finishes — maintains flatness and parallelism within very close tolerances.

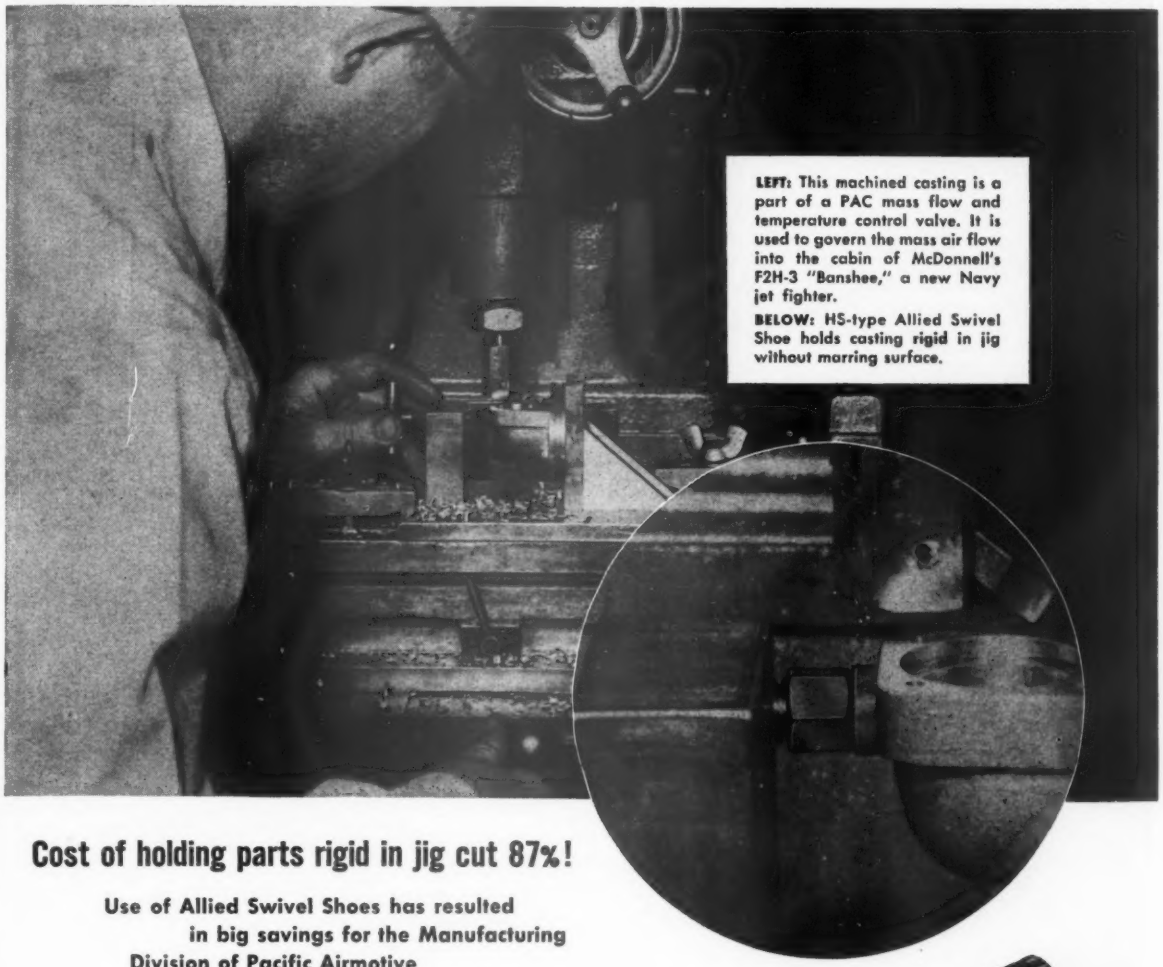
It will pay you to get full details on the Abrasive No. M-34. Send for complete catalog today. Abrasive Machine Tool Co., 16 Dunellen Road, East Providence 14, Rhode Island.

ABRASIVE
ACCURACY BOOSTS PRODUCTION

Abrasive Quality is Reflected in the Finish of Your Product

FOR PRODUCT INFORMATION USE CONVENIENT INFORM-A-GRAM CARD

Allied Swivel Shoes help Pacific Airmotive Corporation get a "tight grip" on tooling costs!



LEFT: This machined casting is a part of a PAC mass flow and temperature control valve. It is used to govern the mass air flow into the cabin of McDonnell's F2H-3 "Banshee," a new Navy jet fighter.

BELOW: HS-type Allied Swivel Shoe holds casting rigid in jig without marring surface.

Cost of holding parts rigid in jig cut 87%!

Use of Allied Swivel Shoes has resulted in big savings for the Manufacturing Division of Pacific Airmotive Corporation, Burbank, California.

Formerly, parts were held in jigs and fixtures with makeshift swivel shoes machined on the job. Cost-conscious tool designers at PAC standardized on mass-produced Allied Swivel Shoes, eliminating this costly custom machining.

Parts are now positioned faster and held tighter without marking or burring the surface. *The cost is less than ⅛ the cost of the old method!*

This same big saving can be yours!

Every shop can use these new cost-cutters. Thousands now in use on mill fixtures, drill jigs, shop tools, screw turrets, etc. They're rust proof and hardened for long life; *can be used over and over!* Ask your industrial distributor for Allied Swivel Shoes today.

Now 4 types available!

H-S SERIES: Hexagon nut with precision-fitted shoe.

S-S SERIES: Socket-head screw with precision-fitted shoe.

N-H SERIES: Set-screw with precision-fitted shoe.

S-H SERIES: Square-head screw with precision-fitted shoe.

All types are available in a wide variety of diameters and lengths.

Allied Swivel Shoes

ALLIED AIR PARTS

662 North Robertson Boulevard, Los Angeles 46, California

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

HARDINGE
ELMIRA, N.Y.

PRECISION PRODUCTS
for
PRECISION PRODUCTION

62 Years of Experience

You get the benefit of 62 years' experience when you specify HARDINGE Collets, Feed Fingers and Pads . . . . . for your automatics, chucking machines and turret lathes.

Manufacturing Collets, Feed Fingers and Pads

Sales Representatives in All Principal Cities

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

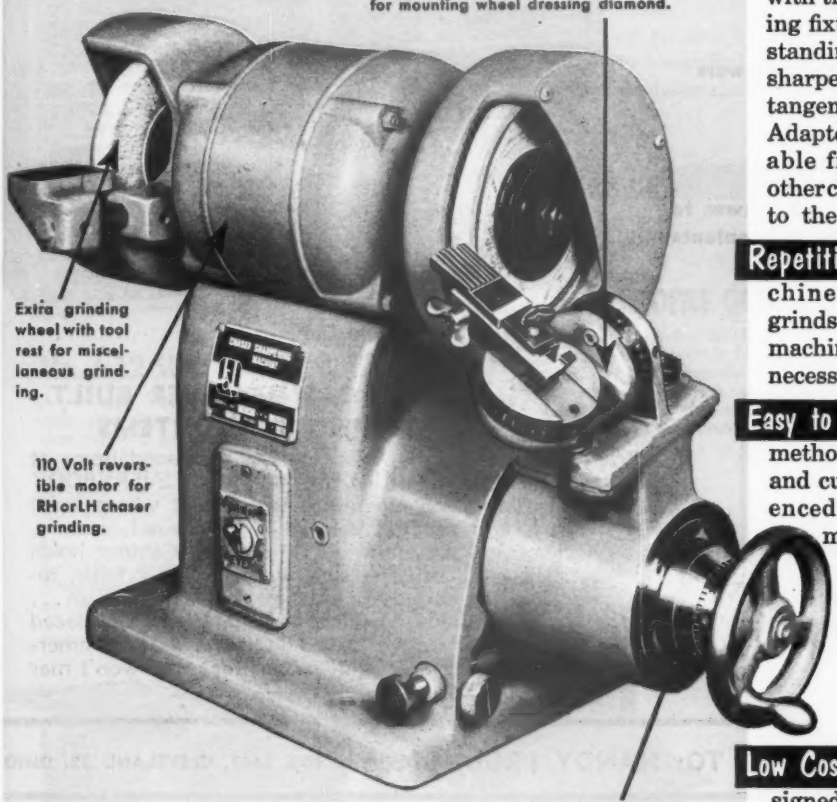
"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

FOR PRODUCT INFORMATION USE CONVENIENT INFORM-A-GRAM CARD

NEW

JONES & LAMSON UNIVERSAL BENCH TYPE CHASER SHARPENING MACHINE

Specifically designed to resharpen chasers, this *Low Cost,* space saving machine allows you to free heavy expensive machine tools for their intended uses, and at the same time do a better job of chaser sharpening. *It's good for miscellaneous small tool and cutter grinding too.*


J & L Universal Grinding Fixture with tangent chaser. Basic fixture has provision for mounting wheel dressing diamond.
Extra grinding wheel with tool rest for miscellaneous grinding.
110 Volt reversible motor for RH or LH chaser grinding.
Graduated micrometer dial to control infeed.

Grinder set up to resharpen J & L Tangent chasers

Universal Application Equipped with the new J & L chaser grinding fixture and adapters, an outstanding job will be done on all sharpening operations, for both tangent and radial die chasers. Adapters for J & L chasers available from stock. Adapters for other chasers can easily be applied to the chaser grinding fixture.

Repetitive Accuracy This machine will duplicate desired grinds repeatedly. It is a precision machine tool equipped with all necessary stops and controls.

Easy to Operate Simple, direct methods speed up the operation and cut costs. Even an inexperienced operator can, in a few minutes, learn to resharpen chasers on this machine.

Saves Space BENCH SPACE 14 x 28 inches is ample for your complete chaser resharpening operation.

Low Cost This complete unit, designed to do your entire chaser resharpening job, sells for only a small fraction of the cost of other bulkier machines often used. Why not install one in your plant, and release your heavier, bulkier machines for their intended uses?

P.S. *Because of its size this machine can well be a time saver in shops where cutter grinding rooms are at distant points from the machines where dies are used. Write Dept. 710G for further details.*

JONES & LAMSON

Machine Tool Craftsmen Since 1835

JONES & LAMSON MACHINE CO., 519 Clinton St., Dept. 710, Springfield, Vt., U.S.A. J&L DIE HEAD DIVISION

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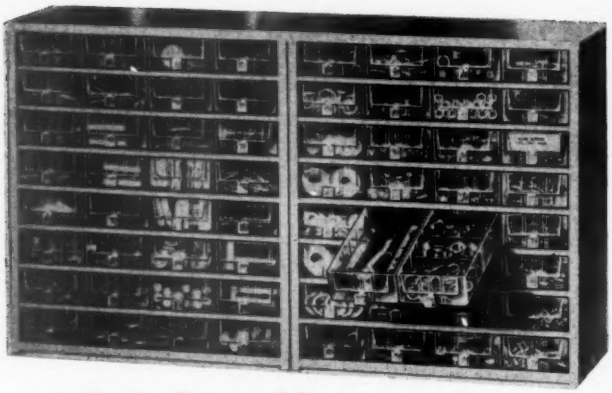
NOW

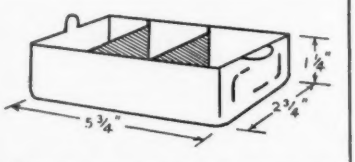
JIFFY CABINETS WITH METAL OR PLASTIC DRAWERS

- **7 useful cabinet sizes**
- **Aluminum or see-thru plastic drawers**
- **Individual drawer guides**
- **Removable drawer-dividers**
- **Safety catch on back of each drawer to prevent accidental spilling of contents**



64 Plastic Drawer Cabinet
(192 Compartments)

Index label and 2 removable drawer dividers for each drawer.



Plastic drawers are 1/8" longer and 3/16" wider.

HANDIEST CABINET EVER BUILT FOR STORING SMALL ITEMS

No more frantic searching for misplaced items at home, shop, office or factory! EVERYBODY needs this convenient storage cabinet where small parts and supplies can be kept indexed, orderly, clean and easy-to-find. Your Jiffy Cabinet holds bolts, nuts, nails, screws, washers, drills, tools, repair parts, carbide tips, labels, radio parts, film... plus hundreds of other small, easily misplaced items! Attractive baked-on, silver-gray hammer-finish steel frame with rubber feet that won't mar any surface.

CLIP AND MAIL TO: HANDY PRODUCTS, P. O. BOX 2447, CLEVELAND 12, OHIO

PLEASE SEND IMMEDIATELY THE QUANTITY AND SIZE JIFFY UNIT LISTED BELOW

PLASTIC Drawer Cabinets ☐ 64 Drw. @$24.95* ☐ 48 Drw. @$20.95* ☐ 32 Drw. @$12.95* ☐ 24 Drw. @$10.95* ☐ 16 Drw. @$7.75* ☐ 12 Drw. @$5.95* ☐ 8 Drw. @$4.25*

METAL Drawer Cabinets ☐ 64 Drw. @$24.95* ☐ 48 Drw. @$19.95* ☐ 32 Drw. @$12.95* ☐ 24 Drw. @$9.95* ☐ 16 Drw. @$7.95* ☐ 12 Drw. @6.95* ☐ 8 Drw. @$4.95*

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BOYAR-SCHULTZ

Tool Room Grinders

Boyar-Schultz Grinders for the tool room and die shop have won a most enviable reputation for accuracy where accuracy counts most. They are dependable . . . the favorite machine tools with skilled mechanics who KNOW how a fine tool must perform.

These tool room grinders have the design, the fine quality materials, and the unexcelled workmanship that make them the best your tool dollar can buy.

No. 6-12 SURFACE GRINDER

A precision Machine Tool built to provide the close tolerance performance that has long been associated only with larger and more costly grinders. Users tell us that it produces flatness, horizontal and vertical tolerance comparable with any other grinder regardless of size.

The new Boyar-Schultz Dust Collector Unit is furnished as optional Equipment. It is built into a new streamlined stand which replaces the stand furnished as regular equipment. No additional floor space is required with Dust Collector Unit.

No. 1 PROFILE GRINDER

A fast operating precision Machine Tool for saving time in grinding odd and irregularly shaped surfaces; fitting dies and punches and other time consuming grinding jobs.

No. 2 PROFILE GRINDER

A Profile Grinder for larger and heavier work. Made in two styles—Single or Dual Spindle. Designed for such heavy work as aircraft, automotive and locomotive building, and other heavy profile grinding.

No. 6-18 SURFACE GRINDER

An extremely accurate Grinder for tool room work and gage grinding, as well as production. Rugged construction and superior engineering assure accuracy over a long period of usefulness.

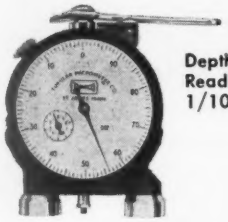
Write for Circulars

BOYAR-SCHULTZ CORPORATION

2112 Walnut Street • Chicago 12, Illinois

DIAL FOR ACCURATE

High Speed Inspection



Depth Gage. Readings to 1/1000th.

1" Range Dial Indicator. Adaptable to many tools. Readings to 1/10,000th.

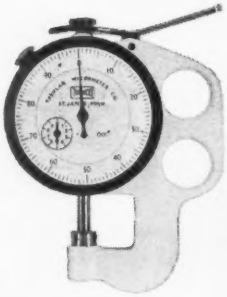
When your production must be held to close tolerances there's a Tumico Dial Indicator gage that will make high speed, accurate inspections. High visibility dials give instant and accurate readings. Our complete and diversified line may provide exactly the right type of dial indicator gage to best speed and insure accurate inspections.

Let our engineers examine your product inspection problem. Write for new catalog showing additional models.

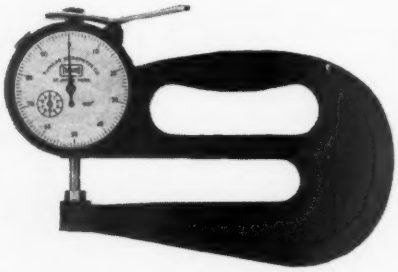
DIAL FOR ACCURATE

High Frequency Checking

1" Range Dial Indicator. Attaches to many tools. Readings to 1/1000th.



Lever Action Hand Thickness Gage with 1" Throat Depth. Readings to 1/1000th.



Lever Action Hand Thickness Gage with 4" Throat Depth. Readings to 1/1000th.

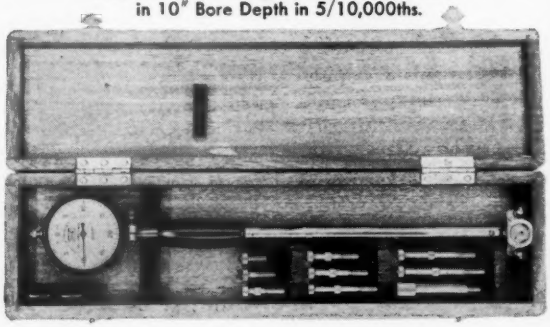
"Quality Control" of production lines can often be improved and speeded up by frequent spot checking with Tumico Dial Indicator hand and bench gages. High visibility assures quick, accurate readings to check vital production points.

Our production engineering department may be able to help you. Write us your problem. Our recommendations and complete catalog showing gages not illustrated will be sent promptly.

TUMICO DIAL INDICATORS

TUBULAR MICROMETER CO., Box 50, St. James, Minnesota

Dial Bore Depth Gage. Range from 2" to 6" in 10" Bore Depth in 5/10,000ths.



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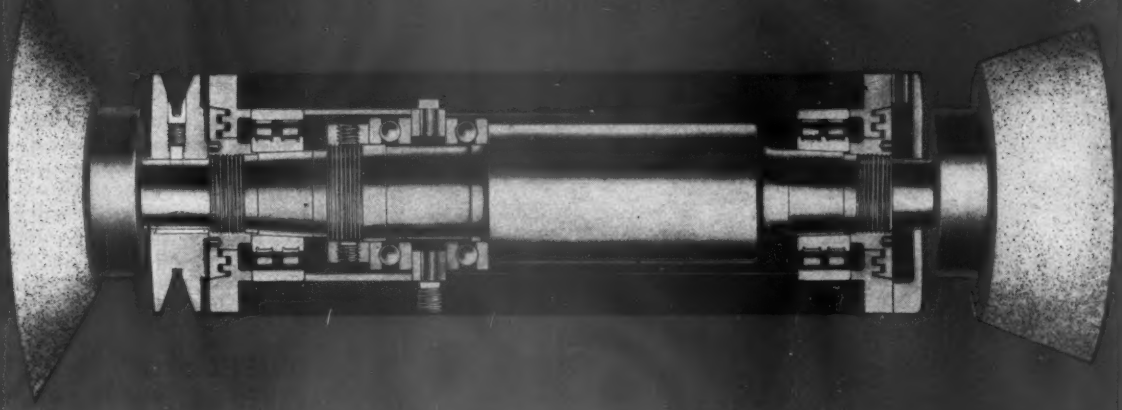
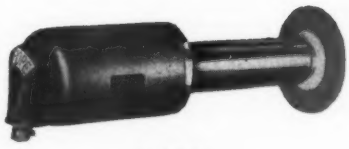
IT'S THE SPINDLE THAT DOES THE WORK





P-32T

P-666

Specify POPE Precision Grinding Spindles and be certain of continuous production of finely finished parts.

Look at the pair of thrust bearings. They eliminate any endwise movement of the shaft in either direction.

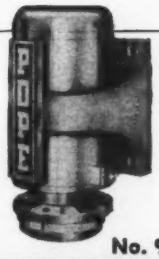
Look at the double row cylindrical roller bearings. They have the rigidity to properly support the wheel for removing metal faster while producing fine surface finishes.

Lubrication — POPE System — requires no attention for the life of the bearings.

P-10009

P-2652A

P-2500



No. 91

Specify **POPE** PRECISION SPINDLES

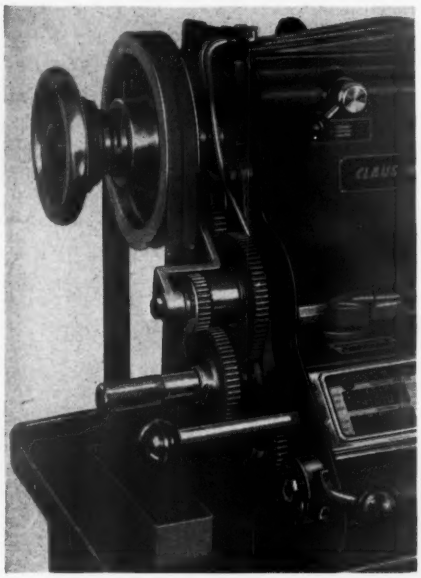
POPE MACHINERY CORPORATION

Established 1920

361 RIVER STREET — HAVERHILL, MASSACHUSETTS

CLAUSING

HEAVY-DUTY PRECISION
12" LATHES
6300 SERIES



"OUTBOARD" DRIVE WITH DUAL A-BELTS

Clausing's drive mechanism is engineered to insure full transmission of power from motor to spindle, quicker speed changes, and easier belt replacements—you don't have to take the spindle assembly apart to replace belts. Drive is underneath with spindle pulley mounted outside so headstock can be enclosed—reverse gears, front spindle and small back gear run in bath of oil. For greater drive traction, the speed variation station is ahead of the speed reduction station, the speed reduction pulley is 8" in diameter, and the spindle pulley is driven by dual A-belts. Back gears are engaged *outside*.

1" COLLET CAPACITY, 1⅜" BORE, TAPERED KEY-DRIVE SPINDLE

The precision-ground steel spindle with 1⅜" bore, 1" Collet capacity, and hardened, ground tapered nose is another of the many features that make Clausing 6300 lathes outstanding in tool rooms and production shops. Others include Timken bearings, splash-lubricated apron and quick-change gear box, heavy duty precision-ground bed. Standard drive provides 8 speeds between 50 and 1300 RPM. "Vari-drive" provides *every* speed between 30 and 1400 RPM. Check *all* the features of this unusual lathe at your Clausing distributors, or send for catalog. Delivery is prompt on priority rated orders.

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PRECISION V BED

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High speed aircraft propeller on test stand—built from tools "spotted in" in a DANLY SPECIAL DIE SET.

DANLY SPECIAL DIE SET, 46 by 140 inches, used for both production and checking of aircraft propeller tools.

DANLY SPECIAL DIE SETS

Final checking of a brazing fixture after "spotting in" to the master. A bridge gage is used with a series of templates as shown.

DEPENDABLE FOR ACCURACY

Here's proof . . . this Danly Special Die Set is used by one of the country's leading aircraft propeller manufacturers for "spotting in" all contour tools for a complete production line. Accuracy is a must because the tools, masters for duplicating planers and profilers as well as holding fixtures, must mate closely with the master pattern and with each other in the sequence of operations.

Dependable accuracy makes Danly Special Die Sets ideal for applications of this kind . . . and rugged construction makes them last longer, too, on any job. That's why leading diemakers everywhere prefer Danly Die Sets!

DANLY MACHINE SPECIALTIES, INC.

2100 South Laramie Avenue • Chicago 50, Illinois

DANLY SPECIAL DIE SET SERVICE IS FAST AND CONVENIENT—CALL YOUR NEAREST DANLY BRANCH

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MILWAUKEE 2 — 111 East Wisconsin Avenue
*PHILADELPHIA 40 — 511 W. Courtland Street
*ROCHESTER 6 — 33 Rutter Street

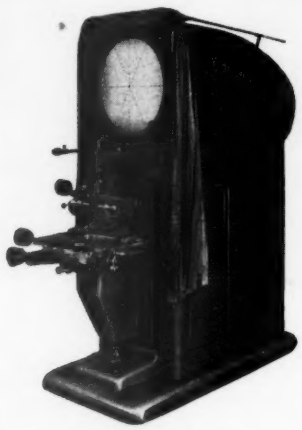
*Indicates complete stock

DANLY®

DIE SETS AND DIEMAKERS' SUPPLIES

which of these 3 optical aids answers Your PRECISION PRODUCTION PROBLEM ?

1



CONTOUR MEASURING PROJECTOR

—You save time and money by spotting inaccuracies quickly and simply . . . with higher precision measurements than any other projector can give you. You get angular measurements to ± 1 minute of arc with a protractor screen, and direct linear measurements to ± .0001″ over a range of 4″ by 6″ with the cross slide stage. Dimensions, angles and profiles of production-run parts can be compared directly with a *traced* outline of the projected image of the master part, or with a scale drawing superimposed on the screen. Write for Catalog D-27.

2

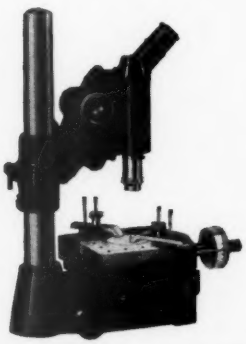
STEREOMICROSCOPES

The finest optical system ever produced for stereoscopic work assures you precision accuracy in small parts assembly operations and in inspection of tools and finished parts. You get clear, sharp, three-dimensional images, and a *wider critical focus than ever before.* The *unreversed,* magnified image is more easily interpreted by the average user. These sturdy, dustproof microscopes are extensively used in industry, either alone or incorporated into machine tools. Write for Catalog D-15.

1853/1953 INTO A NEW CENTURY OF OPTICAL PROGRESS
BAUSCH & LOMB CENTENNIAL

WRITE for complete information on these three important optical aids designed to save you time and money. You may be paying many times over their moderate cost in lost time and rejects. Bausch & Lomb Optical Co., 79815 St. Paul St., Rochester 2, N. Y.

3



TOOLMAKERS' MICROSCOPE

This sturdy microscope gives you one inch linear measurements to ±.0001″ and angular measurements (with protractor eyepiece) to ± 1 minute of arc. Operation is extremely *simple* and *fast.* Opaque and transparent objects of any contour can be measured. Catalog D-22.

B&L Bausch & Lomb *Quality Control* Instruments

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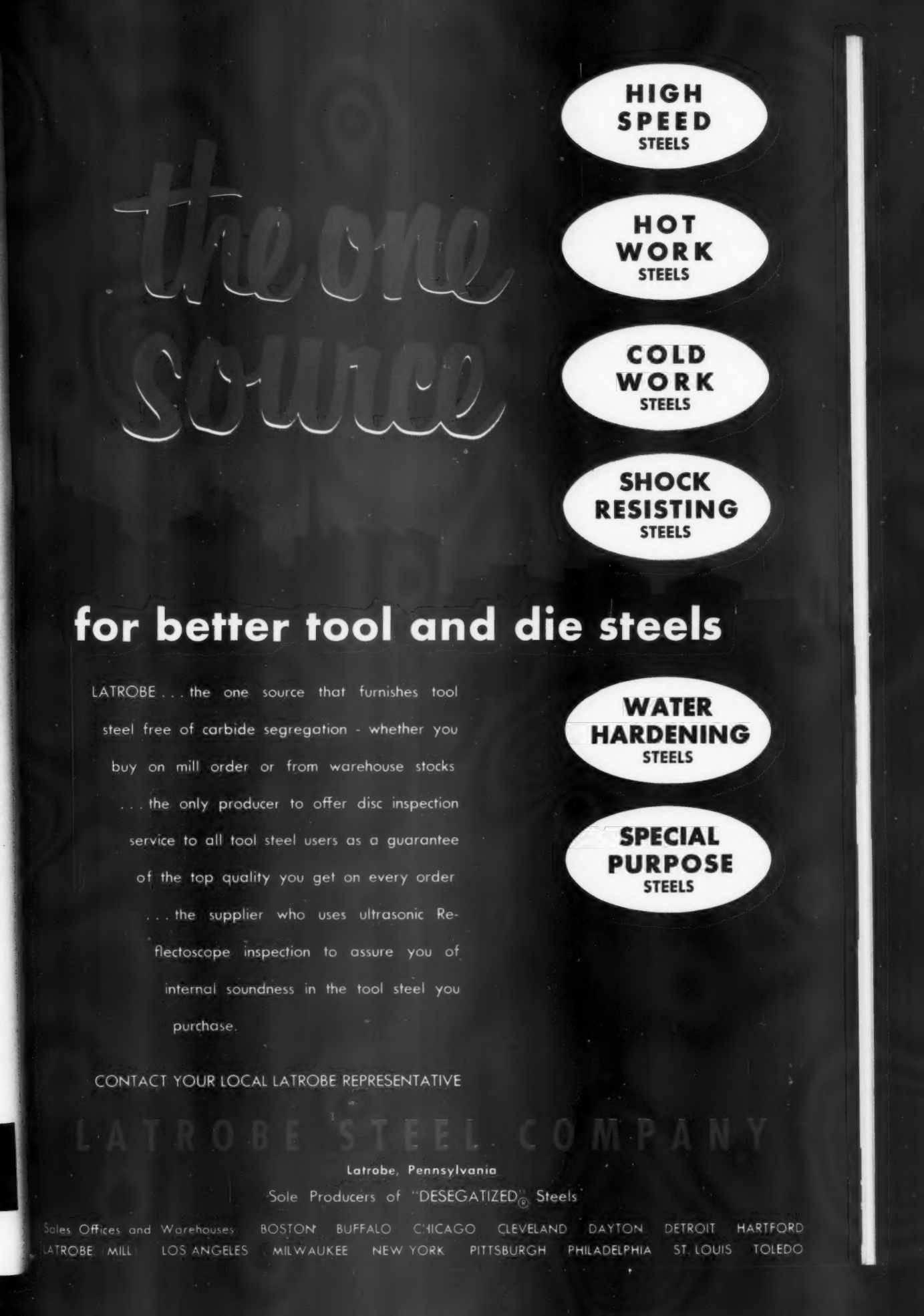
the one source
HIGH SPEED STEELS
HOT WORK STEELS
COLD WORK STEELS
SHOCK RESISTING STEELS
for better tool and die steels
WATER HARDENING STEELS
SPECIAL PURPOSE STEELS
LATROBE . . . the one source that furnishes tool steel free of carbide segregation - whether you buy on mill order or from warehouse stocks . . . the only producer to offer disc inspection service to all tool steel users as a guarantee of the top quality you get on every order . . . the supplier who uses ultrasonic Reflectoscope inspection to assure you of internal soundness in the tool steel you purchase.
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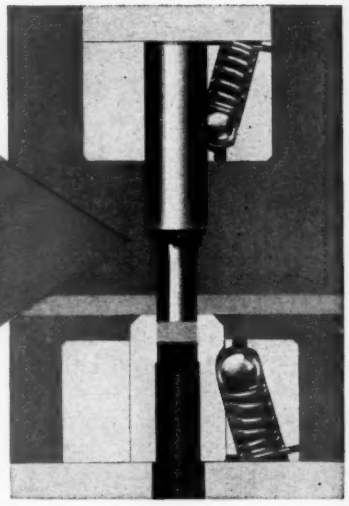
a Punch for Every Purpose

. . . THIN METAL
. . . THICK METAL
. . . SPECIAL ALLOYS
. . . STANDARD SHAPES
. . . UNUSUAL SHAPES
. . . SMALL HOLES
. . . LARGE HOLES



What are your piercing or forming requirements — unusual shapes — large holes — special alloys — thick metals — etc.? There is either an R-B punch in standard shapes and sizes to meet your needs or R-B will manufacture special punches, die buttons and retainers to your specifications.

Regardless of punch type (special or standard) manufactured by R-B for your piercing operation you will find the same standardized R-B features inherent in the design to save you time and money. These include such features as snap-action radial alignment and vertical locking of punches and mating die buttons, speed and ease of insertion or removal, and complete interchangeability.

Many hole-making applications, that formerly required drilling or some other costly means, now can be done with R-B interchangeable punches. If you have thought your piercing jobs too tough for interchangeable punches, it will pay you to investigate the wide application potential of R-B standardized equipment—R-B engineering service is available for your tough piercing problems.

TOOL STANDARDIZATION IS THE BASIS FOR SAVING PRODUCTION TIME. WITH R-B YOU GET THE ACCEPTED STANDARD OF THE SHEET METAL INDUSTRY — IN STANDARD DESIGN FEATURES THAT SAVE IN ENGINEERING, DIE CONSTRUCTION AND OPERATION.

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ALLIED PRODUCTS CORPORATION
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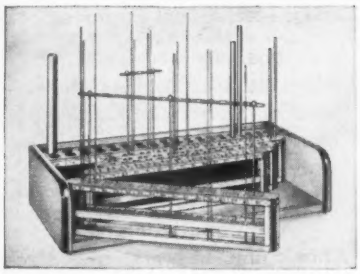
inexpensive

. . . Money Saving Accessories For Your Plant

Each of the accessories illustrated and described below was designed and built for a definite need and used in our own plant before being offered to industry. They require a relatively small investment, yet will save you money every day. For further information, write for the folder offered below.

DRILL ROD RACK

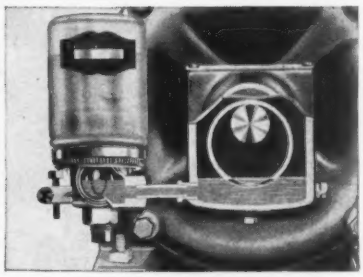


Eliminate trouble and waste effort with this modern method of storing drill rod. Put the Acro rack in a central location of each department and make it simple for each mechanic to select correct rod size in a hurry. It also provides a visual inventory for checking rod replacements.
Accommodates 26 letter sizes, 52 pieces; 47 fractional sizes, 138 pieces; 60 number sizes, 304 pieces. Fractional sizes graduated in 64ths from 1/32" to ½" and in 32nds from ½" to 1" included.

LEADER PIN OILERS

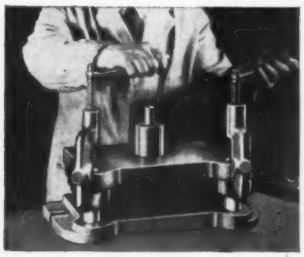
Eliminate wear on your die sets with these leader pin oilers. Acro Pin Oilers, as illustrated, fit over each leader pin and seals in place with a rubber neoprene washer. Each cup is filled with oil so each downward stroke brings bushing in contact with oil and each upward stroke distributes oil evenly over leader pins. Eliminate bushing wear, leader pin scoring, and maintains die accuracy. Die sets equipped with Acro Pin Oilers have run under tests for several weeks to a month without refilling.

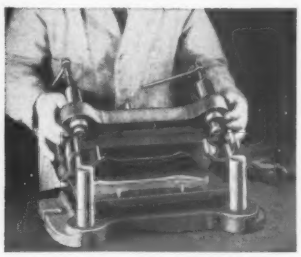
AUTOMATIC LUBRICATORS



With this Acro lubricator, you can lubricate oil ring, capillary, ball or roller bearings on electric motors, blowers, lineshafts and similar bearings for periods as long as six months to one year with one filling. You can save 50 to 95 per cent in oil consumption, practically eliminate maintenance labor and burned out bearings due to faulty hand oiling and guesswork. In addition to savings effected in labor and maintenance, Acro lubricators soon pay for themselves in oil savings alone.

DIE SET PULLERS





The principle of the Acro Die Set Puller is to remove the punch holder from the die shoe by a straight upward pull, whereby punch holder travels upward from die shoe axially, leaving both leader pins simultaneously. This is accomplished only by use of the indexed screw wrenches which act as indicators, controlling the upward travel. This is an exclusive patented Acro feature, found only in Acro Die Set Pullers.

Free Data

covering each of these profitable accessories is included in our folder. Write for bulletin TP-52.

ACRO

METAL STAMPING CO.

330 EAST RESERVOIR AVE.

MILWAUKEE 12, WIS.

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Editorial Index

SOON TO APPEAR IN FUTURE ISSUES

Turret Lathe Tooling for Off-Center Operations on Pump Bodies • Job Shop Methods of Building Die Casting Dies • Power Brushing as a Production Tool • Progressive Die Strippers and Stock Guides • Ultrasonic Machining • Machining and Inspection Fixtures for Torque Converter Parts • Tooling for Precision Castings •

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ROLLERS
SHEARS
ROD PARTERS

Editorial "Automation to Grow Down" 39

Dies

"Strippers and Stock Guides for Progressive and Automatic Progressive Dies," by Ernest J. Urbas, The Guarantee Specialty Manufacturing Co. 41

The various designs of strippers with their companion guides discussed are typical of those used in the stamping industries today.

Assembly Conveyor Line

"Designing a Conveyor Line for Small Parts Assembly" by N. M. Olney, Mechanical Engineer 44

Job analysis and good planning must enter into the design of an efficient assembly conveyor line. Ten factors influence such a design.

Aluminum Stampings

"Aluminum Stampings Produced to Close Tolerances" by James A. Leake, The Leake Stamping Co. 47

Stamping a variety of precision parts for defense applications from aluminum alloy is described and illustrated by Mr. Leake.

Cutting Speeds

"Higher Cutting Speeds—Is The Sky the Limit?" by Hans Ernst, The Cincinnati Milling Machine Company 48

Mr. Ernst develops a formula to determine what the most economical cutting speed should be to produce a workpiece at the lowest cost.

Hardness Testing

"Hardness Testing Equipment and Methods" continued, by John E. Hyler 50

In this installment Mr. Hyler describes the operation and methods of using various types of Brinell testing machines.

Editorial Index

SOON TO APPEAR IN FUTURE ISSUES

Optical Microscopy for the Inspector • Machining the Aluminum Alloys with Carbide Tipped Tools • Grinding and Lapping Stresses in Tool Steel • Weldments Click in Processing Machines • Hand Operated Clamping Fixtures for Aluminum Stators • How to Determine Quality Capability • Ultrasonics as an Inspection Tool •

Carbides

"Cemented Carbides—Their Development and Application", part two, by Lee H. DeWald, National Cylinder Gas Co. 52
In this second part Mr. DeWald continues the discussion of the historical background of cemented carbides and some of the applications.

Punch Presses

"Modern Presses Boost Steel Cartridge Case Production" 68
Double End, horizontal, hydraulic presses increase production of steel cartridge cases by using the return ram stroke for an additional operation.

Plant Maintenance

"Problems in Plant Engineering" by J. E. Gahan, General Aniline & Film Corp. 96
What are the plant engineering functions in a medium sized industrial plant? Mr. Gahan answers this question.

— shorts —

Lapping Small Internal Splines. Spray-On Dye Penetrant 57
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Carbide Tooling Increases Tool Life on Severe Interrupted Cuts 142

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editorial

Automation to Grow Down

Ordinarily we think of things as growing up. As we speculate on the future of automation we are prone to think of it as growing down; down to smaller plants and smaller products; down to them from the gigantic automobile plants, which have been proving grounds for automation.

The development of automation has been spurred by the combination of several needs, i.e., the need to eliminate the application of direct labor to irksome tasks, to heavy and, consequently, hazardous handling operations, and the need to free labor for more highly productive jobs. These factors combine also to lessen costs of production.

As this is written we are beginning to see the lifting of those government controls over our economy which have prevented the full working of American competitive enterprise. The full restoration of competition to the production, distribution and sale of products is bound to force the intensified exploration of the applicability of automation to many new fields.

The building of automobiles entails the handling and processing of relatively large components, i.e., engine blocks, body sections, chassis structures and running gear elements. Before the advent of automation the handling of these components was to a great extent mechanized, via hoists, conveyors, skids, and lift trucks. So, as true automation has been applied to the production of automobiles it has represented appreciably lesser relative gains in productivity, cost reductions and labor saving than could be the case in those fields of manufacture where the elements of mechanization, to say nothing of automation, have not yet been explored.

By these we mean the production lines for such end products as household appliances, radio and television chassis, outboard motors, hardware and utensils to mention but a few mass-produced consumer items.

We are all familiar with the highly automated fabrication of automobile bodies. Here two or more sections are loaded and clamped in a welding jig, a button is pushed and octopus like electrodes move in to the spots to be joined by the surge of current, the electrodes retract, the clamps unclamp, and a one-piece assembly goes on its way.

Contrast this with today's almost piecemeal assembly of a television chassis: staking sockets, transformers, and coils, mounting sub-assemblies, and finally the literally hundreds of manual operations of applying solder to the connections necessary to complete the circuitry. In proportion to selling price and in proportion to the number of parts in the finished product, there is far more direct labor here than in the build-up of an automobile chassis.

Automation will come to television manufacture by way of printed circuits, stacked one on another sandwich-like, integrally molded sub-assemblies, with the whole assembly such a compact and rugged unit that it itself can be used as the forming punch around which a thin sheet protecting shell can be formed in one press stroke. If anyone doubts such a Rube Goldberg concept, just wait ten years!

It is easy to visualize the ultimate automation of the conveyor assembly line described by N. M. Olney in this issue (page 44). Magazine feeds, indexing work station tables, interlocking circuits, selsyn motors, could all be employed to handle, transport, locate, and apply the successive elements of the growing assembly. Admittedly, it sounds expensive, but when you consider that the end result could be one roving supervision between a pair of such lines, the potential cost reduction becomes quite challenging.

All of the needs, ennumerated above, which have sparked the introduction of automation to automobile manufacture, exist in the many other fields. There is nothing more sure in this country's technological economy than the fact that when a need becomes recognized it is filled without further ado.

Finally, the inevitability of more and more automation in more and more fields is backstopped by the statistical picture of our country. Our population is increasing faster than is the size of our working force. That trend means fewer people to make the more things that more people want. That is another way of spelling automation.

E. Willard Remington

editor

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STRIPPERS AND STOCK GUIDES for Progressive and Automatic Progressive Dies

A stripper is an essential and integral part of any die wherein the material fed into the die is being cut. Its purpose, as its name implies, is to strip or remove this material from the punch or punches around which the cut material always clings.

Die strippers play a more important role in die performance than they are usually accredited. They can be employed to render services other than simply stripping material from the punches. Among other things they can serve as draw pads or as guides for punches or they can even serve as forming punches. Literally, they are the "Jack of all trades" of the die part details.

The various designs of strippers with their companion guides as shown here are typical of the methods that are being used by the stamping industries today. A few are excellent, others are exceptionally good, and some are inferior; woefully inadequate to withstand the terrific abuse a stripper is subjected to during its operation.

by Ernest J. Urbas
Superintendent, Tool and Die Department
THE GUARANTEE SPECIALTY MANUFACTURING COMPANY
Cleveland, Ohio

The maximum production of a progressive or automatic die may be attained by any operator if the press tools are designed and built with the press operator's problems fully recognized and given every possible consideration. Starting and running a strip is the press operator's task, so the stock guides and strippers are more important to the operator than are any other parts of the die.

For progressive or automatic progressive dies two types of stippers are applicable; the fixed type and the movable type.

The fixed type is secured to a lower member of the die assembly, and it may be fastened by bolting it directly to the die or through the die to the shoe. The stock guides are sandwiched between the stripping face and die block, and are retained in place by the same bolts that secure the stripper.

The stripping action occurs during the upward or return stroke of the press ram. The stock, clinging to the punches, is raised until it slaps against the stripping face of the stripper. The completion of the return stroke pulls the punches on out of the material.

This continual slapping and whipping, after every hit, crystalizes small-diameter punches and causes them to break off. This is the primary weakness of the fixed type of stripper.

The movable or pressure-loaded type of stripper is mounted on the upper member or on the punch part of the die and, as its name implies, it involves an independent motion in order to perform its stripping function. The movable type stripper is usually found on automatic progressive dies, for on these dies every conceivable improvement must be incorporated in order to achieve the degree of perfection necessary to avoid any possible interruption of the automatic operation.

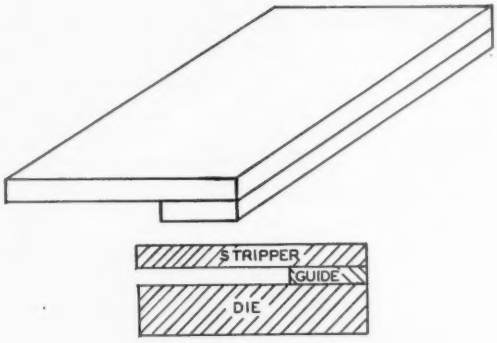
The pressure medium actuates the stripping of the material from the punches. If built-in spring pressure is used as the pressure medium for stripping heavy stock, difficulty is often encountered because not enough space is provided for springs or because the die is weakened by being overdrilled with pockets to seat the springs. On the dieing machine light and heavy materials are stripped with equal ease without ruining the die either by overdrilling for spring pockets or by hitting on broken springs.

From these two types of strippers have emerged a number of variations or styles. The basic styles shown on these pages can be varied by borrowing some feature from one style or another and so producing still other variations. Stock guides, sometimes actually a part of the stripper, are so closely related that they have been included in the stripper designs.

The Open Gap Stripper

The open gap type of stripper is used on a die that is manually operated. That is, the operator must feed the material between the stripper and the die block and must constantly hold the material back against a

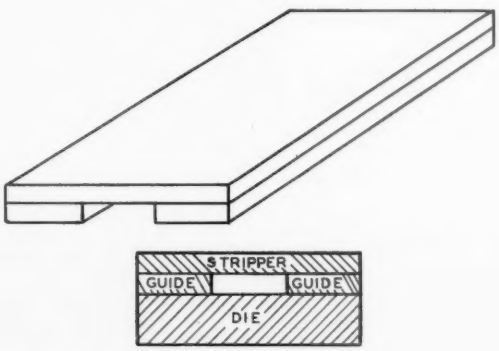
single parallel guide while the die is being operated. On a progressive die, if the material is not held in true parallelism with the guide, either a mis-hit will be made or, after a few hits, the pilots (used to insure proper progression) will have so changed the travel of the strip that a complete blank can not be produced. The strip would have to be dis-



carded, for once it had started away from the guide it could not be forced by any means back to its correct position and travel. If material of 14 gage or heavier is used, the repeated and severe upward impacts against the stripper face would tend to bend or spring the stripper. This would result in the breakage of punches as they attempt to pass through the stripper or breakage of the bolts securing the stripper; either or both.

The Flat Plate Fixed Stripper

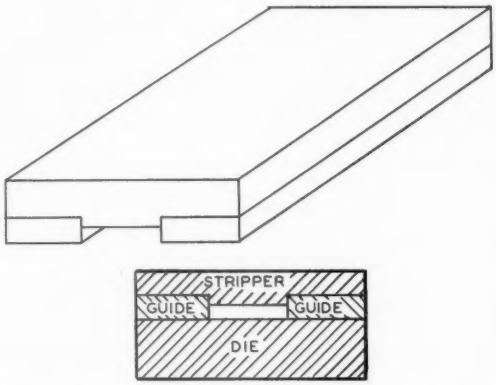
The flat plate fixed type of stripper with two parallel stock guides is usually found on economically priced tools. Although it is by no means the best type it does offer, if properly made, the necessary requirements for successful stock stripping and guiding. The mounting of the guides must be done with extreme precision in order to insure that the stock strip travel is truly parallel with the progressive die layout. The spacing between



the parallel guides should be equal to the maximum width of the sheared or slit stock plus 10% to 15% of its thickness. This should insure free movement of the material through the guides. In the event that a binding and spreading action occurs after a blank is made, due to the narrow skeleton of scrap between the punch and guides, some metal must be removed from the guides, but only from the point of binding on through the balance of the guideway. Never remove metal from the entire length of the guides; this would simply increase the spacing between guides and permit the strip to depart from true parallel travel.

The Center Step Fixed Stripper

The center step fixed type of stripper assures true alignment of the guides with the punch openings. This stripper is usually found on conservatively priced tools. The punch openings and guide clearance (width of step) are machined in one setup. The guides are butted against the step and doweled in place. In the event of having to run material wider than the originally machined step, the

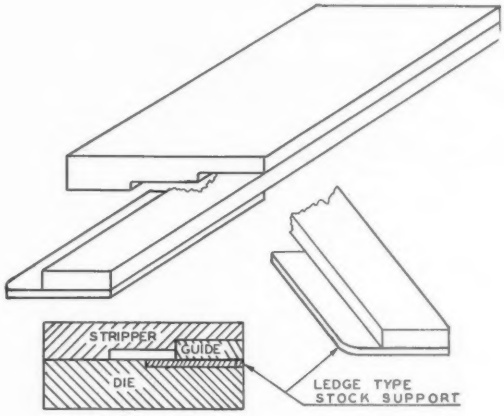


increase over the original stock width is ground off from the working side of the front parallel guide. When reverting back to stock of the original width a new parallel would have to be built and the original guide stored for future use. Often the guide mounting holes are elongated to take care of such a variation. This may be all right as an emergency measure but for a long run program it can cause immeasurable damage to dies and excessive scrap. Also, it could lead to loss of control of shop operation because of the necessitated continual inspection of parts.

The Two Step Fixed Stripper

The two step fixed type of stripper has an extra long parallel guide with a ledge or stock support assembled to the extension.

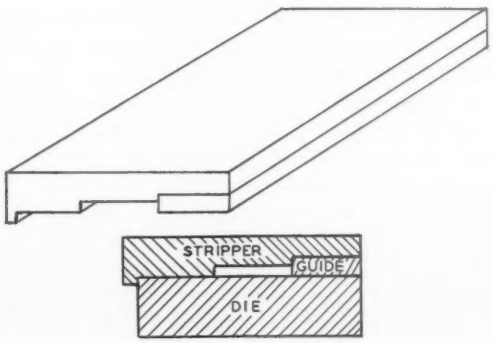
This provides a simple means for the operator of the die to perform his task with more efficiency. So often the die designer designs a die to produce a part in a given manner, the diemaker makes the die to produce the part to size, and both overlook the point of view of the man who is responsible for operating the die. Here, the stripper and stock



guide design offers an opportunity to aid the operator in producing the maximum number of pieces with the least amount of effort. This stripper is machined in one setup so that the one inserted guide is truly parallel with the die progression; the second step providing a butting edge for the long parallel and assuring alignment.

The Three Step Fixed Stripper

The three step fixed type of stripper is usually found on more expensive tooling. Like the center step type, the one parallel insert butts against one step to insure parallelism through the guideway. The second step is the opposite guide surface and the third step is used to butt against the die block. This insures positive mutual alignment between the die, the layout progression, and the parallel guide. This stripper is ideal for



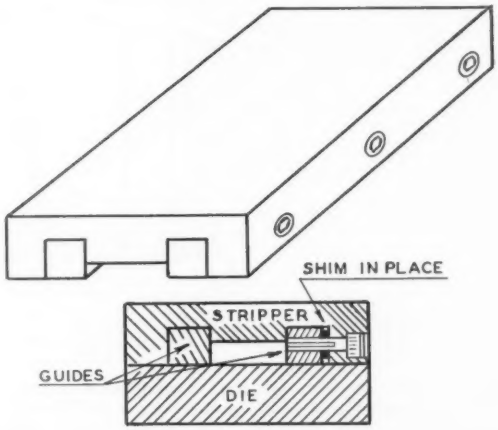
progressive dies using finger stops to control the pitch of stock movement through the die.

This stripper is machined in one setup, which includes machining the three steps and boring the holes for the punches and milling the slots for the finger stops.

Using a long guide with the stock support shelf shown in the previous two step stripper design provides the ultimate in fixed type strippers.

The Insert Fixed Stripper

The insert fixed type of one piece stripper with either one or two inserts offers the advantage of "on the spot" adjustments of the stock guides in the event that material wider than originally specified is brought to the press. This is a more expensive type of stripper to make. For a shop with many



presses, however, this type gives management better job control because of the efficiency it has to offer. This stripper has a shim which can be replaced by a lighter shim to accommodate stock which might come from the slitters wider than specified, hence wider than that most economical for the job. By the same token, re-shimming can reduce the stock guide width to the proper value when stock of the correct width comes along.

Because of the use of side bolts, the guides are thicker than those ordinarily used. To overcome the shock that would be caused by the snap or whip of the material between such high parallels, the stripper should be made with a center step to close the gap between the die block and the stripping face. This space should be approximately two or three times the material thickness. If the guides are subject to severe wear, they must be constructed of a material that can be hardened.

. . . Continued on page 82

Designing A Conveyor Line

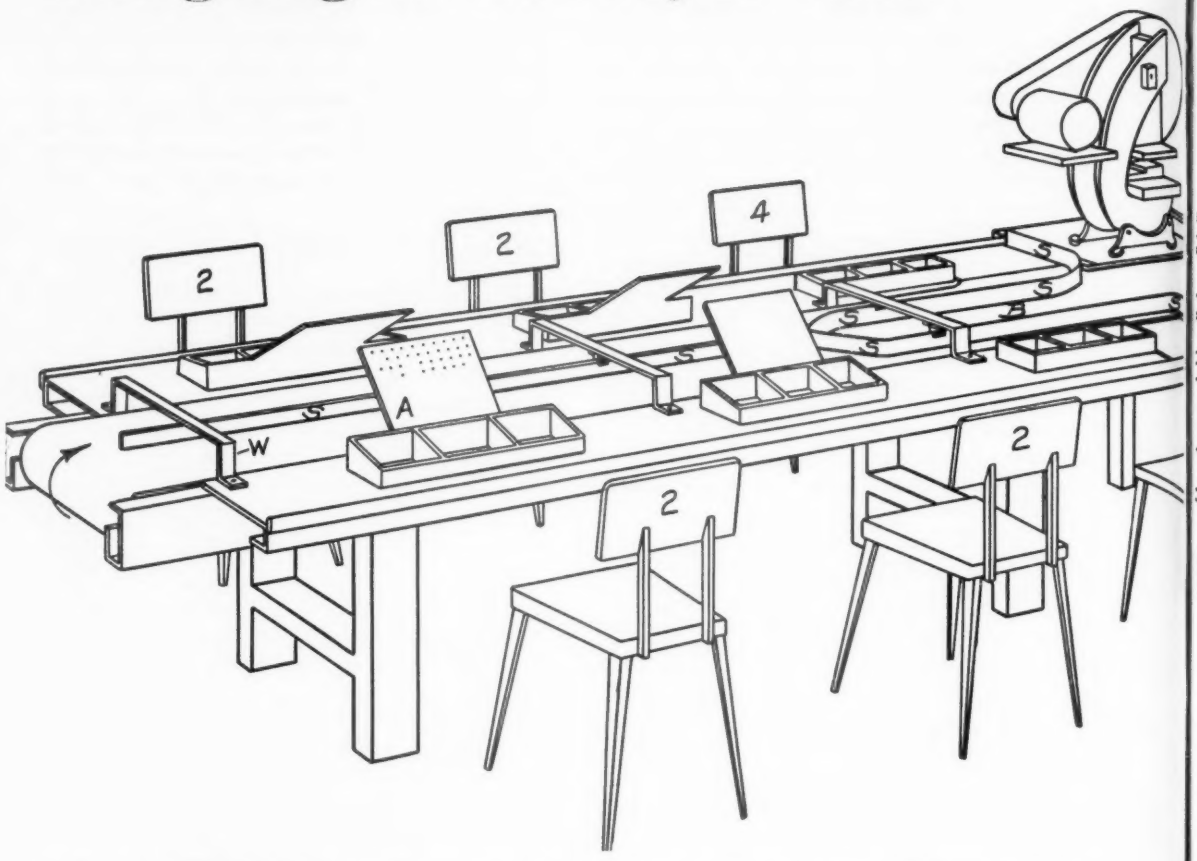
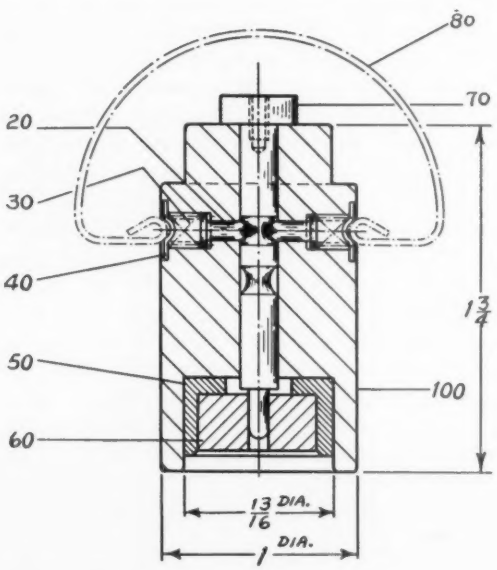


Fig. 1. The schematic layout of a small parts assembly line. This was engineered for the product shown in Figure 2. The requirements are 6000 assemblies per 8-hour day, which are met by four operators each having an output of approximately 200 assemblies per hour. This is relatively high because the operations include the difficult handling of a delicate spring, only 3/16" in diameter and 5/16" long. The number of positions for each operation was determined by time studies. The ultimate success of conveyorized assembly depends upon good planning and the assured availability of fully interchangeable parts; the length of the line and the number of parts involved are purely relative quantities.

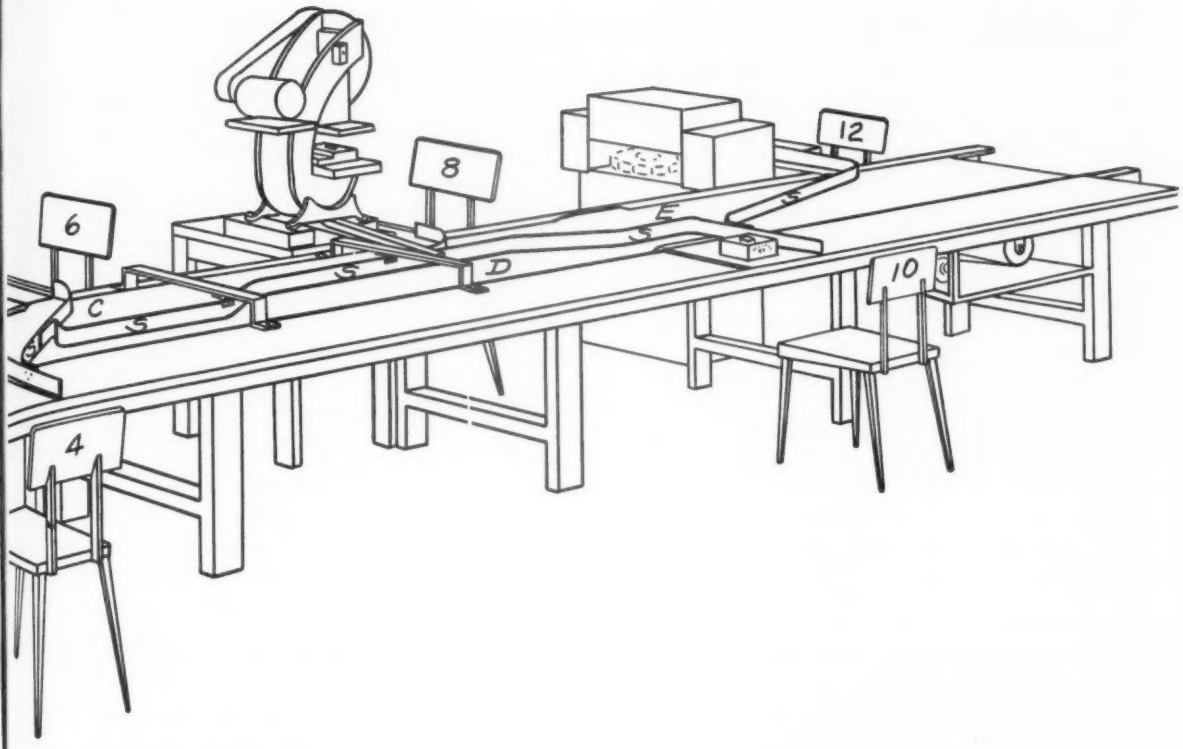


In any competitive economy, the size of the market for any product depends upon price, and price depends upon cost of production. Consequently in order to maintain sales in the face of increasing costs, high taxes and competition, manufacturers must strive more than ever before to achieve cost reduction through better tooling, mechanization and more efficient assembly methods.

In this connection the engineer in the small or medium size plant is often confronted with the problem of "How to design an efficient conveyor line for small parts assembly".

It is important to keep clearly in mind that what is commonly called "Straight Line Assembly" and often visualized by a graphic diagram in the plant manager's office may

Fig. 2. The finished assembly. The broken line, detail 80, does not represent a part of the assembly; it being a spring wire clip used as a temporary clamp to hold the assembly together until detail 40 is permanently staked in place.



for Small Parts Assembly

by N. M. Olney
Mechanical Engineer,
New York, N. Y.

be far from the true state of affairs. High assembly costs may not necessarily be the fault of either the assembly department or the design of the conveyor line. It may be due to lack of good planning. Parts not in conformance with drawings or not designed for interchangeability cause difficult assembly and corrective operations on the line. It may be due to inadequate inspection of components prior to assembly, etc.

Any one or combination of these factors can transpose what may have been intended as a good installation into a trouble spot. These conditions have a vital bearing on the design, performance and cost of an assembly line operation and where they exist must be corrected if objectives are to be realized.

Efficiency has been defined as the ratio of results to effort and the most efficient method is that which provides the best result from a specific combination of factors. Generally, the factors which influence the design of an efficient installation are: —

1. Design or characteristics of the product and daily requirements.
2. Type of tools, workplace and equipment required.
3. Number of operations and sequence.
4. Number of stations required to maintain a "balanced line".
5. Floor space requirements.
6. Width, length and speed of belt (F.P.M.).
7. Provision of suitable trays if required for parts storage prior to and following assembly.
8. Design and installation of separators or guides to direct work during transit from station to station.
9. Line inspection or test facilities.
10. Provision of sufficient electrical and air outlets on the conveyor to permit use of power or air operated tools, machines, etc.

Properly planned, installed and operated, the conveyorized assembly line becomes a vitally important tool of the production organization and provides the best means of integrating parts, tools, equipment and operator into a highly efficient and productive unit. How this was recently accomplished in one particular case is illustrated by the schematic

layout of Figure 1, and the assembled product drawing, Figure 2.

Requirements are 6000 assemblies per 8-hour day. Starting at station 2, details 20-30-40 and 80 are assembled to both sides of detail 100 which is delivered to the line in trays. Detail 80 is not part of the assembly but is a spring wire clip used as a temporary clamping device to hold the assembly together until detail 40 is permanently staked in place with detail 100. Four operators are required and output for each is approximately 200 assemblies per hour.

This relatively high output (considering the difficulty of handling a 3/16" diameter x 5/16" long delicate spring) is made possible by preparing springs for assembly in the following manner. Two operators at a table nearby disengage the nested springs and place each on round-nosed steel pins driven into plywood boards 10" x 10" x ½". The pins are ⅛" diameter by ⅞" long and project approximately ½" above the board surface. Each board contains 100 pins and is painted black to facilitate visibility. Two or three full boards are placed on the left side of each work place of station 2. In use a board is positioned as shown at "A". This preparatory step is more practical and economical than if it had been included in the line assembly operation.

The completed work is placed on the belt and travels to operators at station 4 where details 50-60 and 70 are added. It is then put into area "B" and travels to station 6 where it is staked both sides at one time in a cam operated die. Upon completion, clip 80 is removed, dropped into a container for re-use and the staked work is placed in area "C" and proceeds to station 8.

The finished work is dropped into a tubular chute from which it drops out into area "D" and conveyed to station 10 for inspection. Incidentally, the chute eliminates the necessity for the operator to reach a considerable distance in order to deposit work on the conveyor belt. Following inspection the work is placed in area "E" and continues to station 12 for the final operation and is then stored in trays.

The number of positions for each operation was determined by time studies. A layout indicated that a conveyor 3 feet wide with two side leaves and having a bed length of 30 feet with a 12 inch wide belt would be suitable.

A conveyor of this type for small parts assembly offers many advantages. It is a complete and self contained unit which can be varied in length by the addition or removal of standard length sections as required. Parts of the sheet metal tables may easily be cut out at practically any point along its length thereby permitting close location of equipment or operators to meet special conditions. It permits good visibility and reach for the operator, etc. As a piece of general purpose equipment it can readily be adapted to a variety of other assembly jobs.

From the ordering and cost standpoint it is advisable to use a build-up of standard length sections. In this particular case two ten foot sections were specified. The unit was ordered with fixed adjustable supports providing a standard elevation of 34 inches with adjustments of plus or minus 3 inches. Equipped with a ¼ HP 3 phase 60 cycle motor and variable speed drive it provided a belt speed of 5 to 12½ feet per minute. Following installation, the steel table tops were covered with ¼" thick masonite and edged with wood moulding to prevent parts from accidently rolling off during assembly.

The method of directing the work from station to station was accomplished by means of the separators or guides, "S". These were made of brass strips ⅛" thick by 2" wide and shaped to suit. The radius of the bends was made as large as conditions permitted and the angles 45 degrees or more to facilitate transit with the least amount of resistance or hesitation. Forming was done with general purpose tools or by bending around steel shafting held in a vise. The guides were positioned approximately ⅛" above the surface of the belt and held rigidly in place by cross members "W" which were bolted to the table.

The workplace layout was arranged consistent with good motion economy and the stations were spaced to provide adequate freedom of movement for each operator without crowding or waste of valuable space.

Summarizing, the case history presented here may be found applicable to a variety of products suited to conveyorized assembly methods. The number of components and the length of the line are relative quantities. Good planning and the assured availability of fully interchangeable parts exert a greater influence. Their importance cannot be overemphasized. This combined with an efficiently designed installation will provide maximum output at minimum cost.

Aluminum Stampings Produced to Close Tolerances

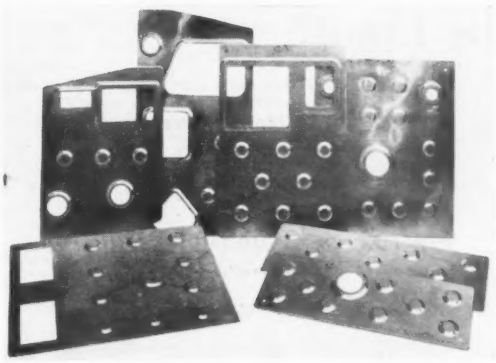


Fig. 1. These seven different "inner pans" are components for military computers. They are of 61SO aluminum, .032" thick, and have to be held to close dimensional tolerances.

Precise aluminum alloy stampings for a variety of defense applications have become important items in the manufacturing operations of The Leake Stamping Company. There are several styles of pans and covers for computer machines which must be flat and free from "oil can" or buckling. Other parts of thicker stock are destined as components for aircraft fuel tanks and napalm bombs. Wheel fairings for aircraft brake assemblies are also in production.

These products are not so unusual as some stampings in respect to shape but, in regard to the dimensional limits held, they represent noteworthy achievements, as tolerances are close and every part must pass exacting inspections.

Seven different computer stampings known as "inner pans" are shown in Figure 1. They are produced from 61 SO aluminum 0.032 in. thick and include shallow flanges held to close tolerances as to length, width and angle with reference to the flat face. Embossings help to provide stiffness and clearance but drawing has to be done so that deviation from true flatness in remaining areas does not exceed 1/16 in. per lineal foot. This is checked by laying each large area stamping on a surface plate. If the deviation exceeds this limit, the part must be restruck and rechecked.

Fig. 2. Here are fourteen different shapes and sizes of computer covers fabricated from .072" aluminum sheet of the 61ST4 specification. The problem here is the avoidance of buckling and the "oil can" effect.

The cover stampings, shown in Figure 2, look to be simple enough but when it is considered that they are made from 61 ST4 aluminum of 0.072 in. thickness and that this is more or less comparable to spring steel in working properties, the problem of making them is found to be much more difficult than a casual glance would indicate. These covers have to be embossed to two different depths,

Fig. 3. Fuel tanks of the jettison type and napalm bombs use stampings such as these, made from aluminum alloy of the 52SO type, .103" thick.

3/8 and 3/4 in., and it must be so done that no buckling or "oil can" effects are produced. After embossing, the covers are heat-treated, that is, are given accelerated aging, to convert the metal from the T4 to the T6 condition. Formed radii are only 1/16 in.

Baffles having flanged lightening holes are produced in many shapes and sizes of which two are shown in Figure 3. They are formed from 52 SO aluminum 0.103 in. thick and are applied in jettisonable fuel tanks and in Napalm bombs. Flanged edges have to be

. . . *Continued on page 58*

by: James A. Leake
Plant Manager
THE LEAKE STAMPING COMPANY
Monroe, Michigan

HIGHER CUTTING SPEEDS
. . . Is the Sky the Limit?

by Hans Ernst
Director of Research

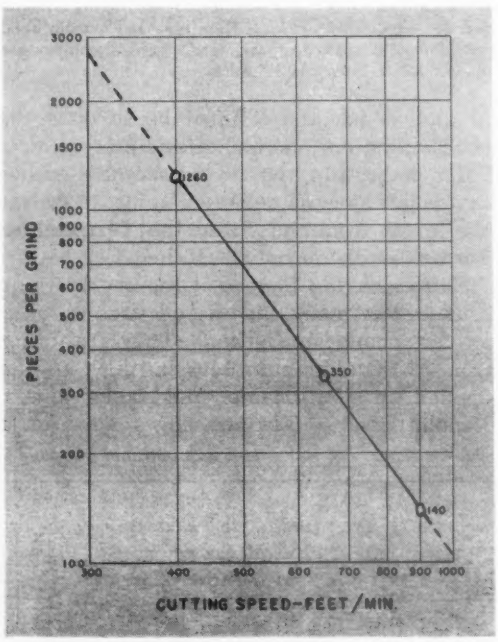
THE CINCINNATI MILLING MACHINE CO.
Cincinnati, Ohio

THE COURSE OF MACHINE TOOL HISTORY has been marked by the use of higher and higher cutting speeds as new and improved machines and new and improved tool materials have been introduced. In the past few years some writers have urged the use of cutting speeds even much higher than are now being used in commercial practice. Some have contended that just byond these presently used speeds lies a "Valley of Death", which, if we only had the courage to cross, would be passed over to a "Promised Land" of almost everlasting tool life. Is this fact, or fiction?

As we see it, from observations of current practice, from carefully conducted tests, and from fundamental considerations, the facts "as of today" are as follows:

Throughout industry there are many machining operations on which cutting speed might be profitably increased. Too often the cutting speed for a given material and operation has been set in accordance with some generalized recommendation — or to provide some arbitrary value of tool life — which does not necessarily give the minimum cost per piece. The criterion for effective machine operation is **total** cost per piece.

Fig. 1. Log-log plot of tool life, measured in terms of number of pieces per grind, for various values of cutting speed.



For a given feed increment (per revolution, or per tooth), as the cutting speed is increased the time for the cut is lowered. In opposition, however, is the fact that as the cutting speed is increased (with all other conditions constant) the tool life is decreased, thus causing an increase in cost on account of more frequent tool changing and sharpening. The optimum cutting speed, in terms of minimum cost per piece, is therefore reached when the rate of decrease in cost caused by an increase in cutting speed, is balanced by the rate of rise in cost due to the decrease in tool life. Wherever the production volume on a given workpiece will justify it, the cutting speed should be determined from a careful analysis of **all** the cost-controlling factors.

The influence of these factors on the total cost per piece is illustrated by the following example:

Let us assume that we are dealing with a simple face milling operation using a 4" diameter, 6 tooth, carbide tipped cutter, with a feed per tooth of .010". The workpiece might be a steel forging about 8" long, held in a quick-acting air operated fixture. In order to determine the approximate relationship between cutting speed and tool life, it is assumed that we have made several runs at each of three representative speeds, say 400, 650, and 900 feet per minute (with a constant feed per tooth) and have found that the average "pieces per grind" for these speeds were 1260, 350, and 140 respectively. As might be expected these values fall approximately on a straight line when plotted on log-log paper, as in Figure 1.

Copyright 1952, The Cincinnati Milling Machine Co.

Let us assume also that we have determined the following facts:

Idle time per cycle (for loading, rapid advance, rapid return and unloading) . . . . 0.3 minutes

Feeding distance (Length of work + Cutter diameter) ..... 12"

Then,

Feeding time per cycle (minutes)

$$= \frac{\text{Feeding Distance} \times \text{Cutter Diameter} \times \pi}{\text{Feed per Tooth} \times \text{No. of Teeth} \times 12 \times \text{Cutting Speed}}$$

$$= \frac{12 \times 4 \times \pi}{.010 \times 6 \times 12 \times \text{Cutting Speed}}$$

$$= \frac{210}{\text{Cutting Speed}}$$

Total time for cutting cycle (minutes)

$$= .3 + \frac{210}{\text{Cutting Speed}}$$

If,

Labor plus overhead on milling machine = $6.00 per hour, then

Milling cost per piece

$$= \left(.3 + \frac{210}{\text{Cutting Speed}}\right) \times \frac{6}{60}$$

$$= .03 + \frac{21}{\text{Cutting Speed}}$$

If average time to change cutters and reset machine = 15 minutes, and average time to grind cutter = 30 minutes, and if labor plus overhead on cutter grinder = $4.00 per hour, then Cost for changing and sharpening cutter

$$= \left(\frac{15 \times 6}{60}\right) + \left(\frac{30 \times 4}{60}\right) \$3.50, \text{ and}$$

$$\text{Cutter changing and sharpening cost per piece} = \frac{3.50}{\text{Pieces per Grind (Fig. 1)}}$$

Total cost per piece for any given cutting speed and corresponding number of pieces per grind, therefore

$$= .03 + \frac{21}{\text{Cutting Speed}} + \frac{3.50}{\text{Pieces per Grind}}$$

Figure 2 shows the total cost per piece plotted against cutting speed for this particular example, as calculated from the above equation. In this case it is evident that the optimum cutting speed (for minimum cost per piece) is in the neighborhood of 700 ft/min. However, a somewhat higher cutting speed (with a corresponding increase in feed rate) may be used, if desired, in order to obtain higher production with only a small increase in cost per piece.

Also shown in Figure 2 are the rapid traverse and loading cost, the actual metal cutting cost, and the cost of cutter changing and sharpening. These items add up as shown, to give the total cost per piece. The influence of cutting speed on production, in terms of number of pieces per hour, is shown by the dotted line.

For the commonly used aluminum alloys it appears that the optimum cutting speed (determined as indicated above) lies well

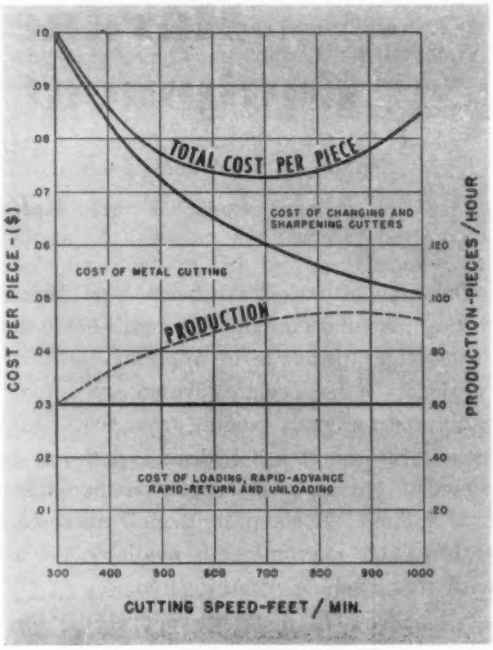


Fig. 2. Increasing the cutting speed first lowers then raises the Tool Cost Per Piece, as the rising cost of changing and sharpening cutters overbalances the saving in metal cutting time. (In this particular example the minimum cost per piece occurs at about 700 feet per minute.)

above the values which, because of other limitations, are now commercially obtainable. At cutting speeds of 15,000 ft/min. on most of these alloys, tool life is still very high.

A second reason why presently used cutting speeds are often too low is that sufficient care is not always taken to ensure the best possible operating conditions. For the same tool life, in many machining operations the cutting speed (and consequently the production) could be considerably increased if the workpiece were supported more rigidly; if the setup and mechanical condition of the machine were improved so as to eliminate vibration, or if an effective vibration damper were provided; if the feed increment (per revolution, or per tooth) and the tool angles were adjusted to their optimum values; if the tools or cutters were correctly sharpened; if an effective cutting fluid were used and properly applied; and if the microstructure of the work material were controlled by specification or by heat-treatment so as to provide the highest possible degree of machinability consistent with other required physical properties. Large increases in the optimum cutting speed have recently been made in specific cases by proper control of microstructure.

. . . Continued on page 136

HIGHER CUTTING SPEEDS
. . . Is the Sky the Limit?

by Hans Ernst
Director of Research

THE CINCINNATI MILLING MACHINE CO.
Cincinnati, Ohio

THE COURSE OF MACHINE TOOL HISTORY has been marked by the use of higher and higher cutting speeds as new and improved machines and new and improved tool materials have been introduced. In the past few years some writers have urged the use of cutting speeds even much higher than are now being used in commercial practice. Some have contended that just beyond these presently used speeds lies a "Valley of Death", which, if we only had the courage to cross, would be passed over to a "Promised Land" of almost everlasting tool life. Is this fact, or fiction?

As we see it, from observations of current practice, from carefully conducted tests, and from fundamental considerations, the facts "as of today" are as follows:

Throughout industry there are many machining operations on which cutting speed might be profitably increased. Too often the cutting speed for a given material and operation has been set in accordance with some generalized recommendation — or to provide some arbitrary value of tool life — which does not necessarily give the minimum cost per piece. The criterion for effective machine operation is **total** cost per piece.

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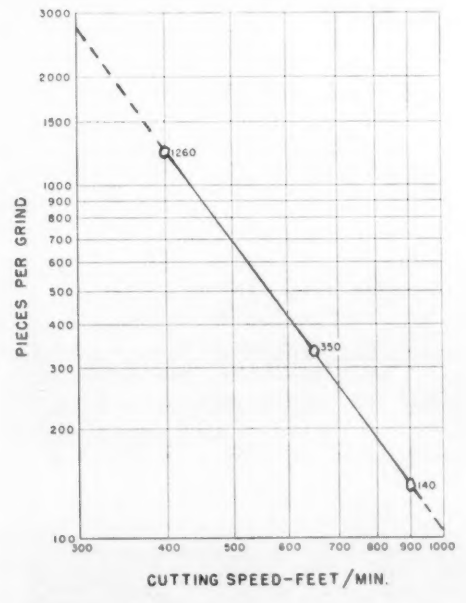

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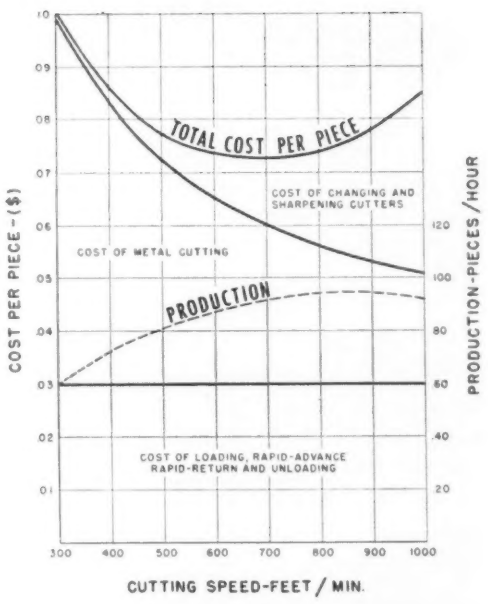

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. . . Continued on page 136

Hardness Testing Equipment and Methods

Continued*

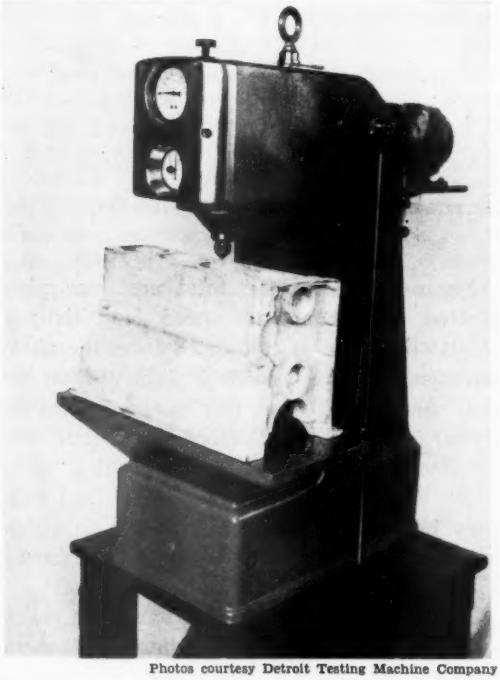
by John E. Hyler

One-manually-operated bench-type Brinell testing machine employs the multi-beam and dead-weight principle of applying the striking load. It has weights which are actually calibrated for loads ranging from 500 to 3,000 kg. It incorporates a hydraulic dashpot, designed to eliminate any shock on the load as it is applied. A standard Brinell microscope with a stage micrometer is available for use with this machine when desired.

An instrument distinctly out of the ordinary, in the field of Brinell testing, is a portable hardness testing hammer. This unit is designed for making hardness tests on large, heavy, or otherwise hard-to-handle pieces, wherever they may be located. It is hand-operated, lightweight, and easy to carry from place to place. When used properly and carefully, it gives very accurate results. The two principal requirements are that the instrument must be held perpendicular to the surface being tested, and that the test piece either be on a firm foundation, or be of sufficient mass that it will not deflect when the impression is made.

The hammer consists of a cylindrical

The hardness testing device shown here is decidely out of the ordinary. It is a portable hardness testing hammer, designed for making Brinell hardness tests on large, heavy, or otherwise hard-to-handle pieces, wherever they may be located. The hammer incorporates a cylindrical housing and an easy-moving piston. A 10 mm Brinell ball is employed. Between the piston and adjustable cap is a strong inertia spring.



Photos courtesy Detroit Testing Machine Company

The hardness testing unit here seen allows Brinell testing to be stepped up in line with other production operations. Tolerance hands on the lower dial are set to desired limits, and the operator merely notes that the indicator points stop within them. Accuracy of the setting may be checked with a microscope at any time, and occasional pieces tested without disturbing the production setup. The direct-reading mechanism is hydraulically operated and positive, and works equally well on round and flat work.

*See page 64, TOOLING & PRODUCTION, January 1953.

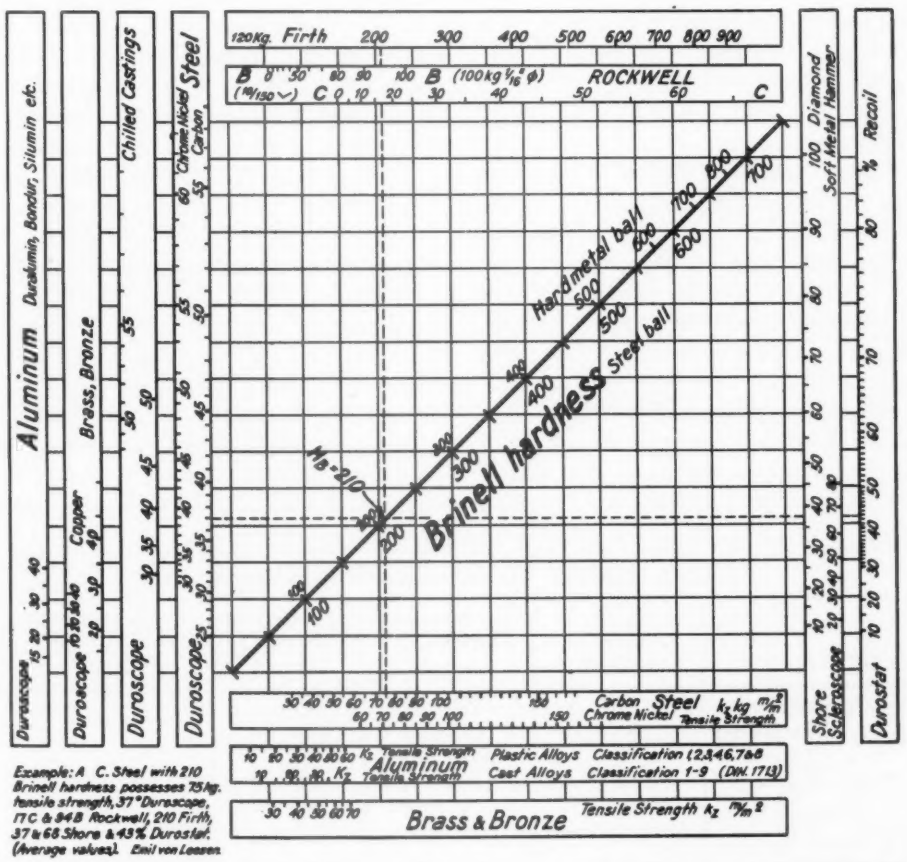
housing and an easy moving piston. The housing is closed at one end with an adjustable threaded cap. On the opposite end, a movable shaft is provided. On the end of this shaft is mounted a standard 10 mm Brinell ball. Between the piston and the adjustable cap is installed a strong inertia spring. Adjustment of the cap determines strength of spring. When a force of approximately 45 pounds is exerted by the operator on the cap end of the hammer, the tripping mechanism (which is integral with the piston) allows the piston to deliver a uniform blow. This blow is equivalent to a 3,000 kg applied load to the shaft carrying the Brinell ball, thus making the Brinell impression.

The piston is then returned to its former position by a spring in the cylinder. There is a cushion of compressed air in front of the guiding ring, which causes a slow backward movement of the ball, thus preventing spoilage of the impression just made. Diameter of the Brinell impression is then measured with a standard Brinell miscroscope, and reference is made to the hardness chart furnished, to determine the Brinell hardness number.

Compensation for Shock Load

There is, however, a difference between a shock load as applied by the hammer described, and an applied load of 3,000 kg. Therefore, the impression made with such a hammer varies slightly in some cases from that produced by a conventional Brinell hardness tester. However, this has been compensated for by use of a special Brinell chart furnished with the unit. Using this chart, excellent results are obtained.

. . . *Continued on page 70*



Example: A C. Steel with 210 Brinell hardness possesses 75 kg. tensile strength, 37° Duroscope, 17 C & 94 B Rockwell, 210 Firth, 37 & 68 Shore & 43% Durastat. (Average values). Emil von Lossen

Chart courtesy of R. Y. Ferner Company, Inc.

It is dangerous to use comparative lists on exact studies. Hardness is a term subject to varying definitions, and therefore has no common meaning. In shop practice, however, conversion scales of one kind or another are often required, and are trustworthy up to a point. An interesting chart depicting fairly close relative values as based on Brinell hardness initially, is here seen. Note the example cited at lower left.

CEMENTED CARBIDES

...their Development and Application

PART TWO OF TWO PARTS

by Lee H. DeWald
Chief Metallurgist
NATIONAL CYLINDER GAS COMPANY
Chicago, Illinois

THE PREDOMINATING CONSTITUENT in most carbide compositions is still tungsten carbide. The maximum binder content rarely exceeds 30%, which would be a special grade. Typical compositions and some essential property values are shown in Figure 15. The basic reason for adding other constituents was to produce compositions capable of cutting steels. Prior to the use of the titanium and tantalum-bearing grades, the steel cutting operation resulted in rapid failure, due to a pit forming just behind the cutting edge. This pit is usually referred to as a crater.

In the 1930's Balke,[9] McKenna[10] and others suggested the use of tantalum carbide in the carbide compositions. At first, a complete substitution of tantalum carbide for the tungsten carbide was attempted, but the strength and wear resistance was much short of that possessed by the straight tungsten carbide compositions, and too low for any severe applications. It was found, however, that minor additions of tantalum carbide to the straight tungsten carbide grades almost completely eliminated the tendency to crater.

Titanium carbide[11] had also been tried in Europe as a constituent in cast alloys as far back as 1925, with relatively good success as a steel cutting tool in many cases. Its tendency to decarburize during heat treatment, however, resulted in too serious a depreciation of physical property values. Later Schwartzkopf[12] and others in Europe and McKenna[13] in the United States developed methods of utilizing the good qualities of the titanium carbide while suppressing its instability by pre-reacting tungsten and titanium carbides to form complex molecules. There are various methods of doing this, ranging from crystallization in a metal menstruum or by pressing the finely pulverized carbides with a fugitive binder into a slug, and volatilizing the binder at high temperatures. The titanium containing grades are much less shock-resistant, but possess greater wear resistance.

TYPICAL CARBIDE COMPOSITIONS AND PROPERTIES

COMPOSITIONS	Ra HARDNESS	TRANS. STRENGTH x 10^3	COMPR. STRENGTH x 10^3 Ult.	P.L.	YOUNG'S MODULUS Psi x 10^6
97% WC-3% Co	92.7	125 - 180	815	780	97.5
94% WC-6% Co-F	90.7	200 - 275	680	540	88.0
94% WC-6% Co-N	91.9	180 - 225	750	600	—
91% WC-9% Co	90.0	250 - 350	605	470	83.0
87% WC-13% Co	88.5	280 - 375	540	420	80.0
74% WC-20% TaC-6% Co	90.0	200 - 300	750	670	91.0
79% WC-15% TiC-6% Co	92.5	135 -175	750	670	77.0

Thermal Cond. (cal/sec/cm^2/cm/°C) 0.09 in 15% TaC — 0.65 in 87% WC - 13% Co
Thermal Exp. (20°C - 800°C) 7.0×10^{-6} in 15% TiC — 5.0×10^{-6} in 87% WC - 13% Co

Figure 15

The tantalum carbide-bearing grades, on the other hand, are much stronger and more crater resistant than the titanium grades if present in similar volumetric percentages. The weight percentage of added tantalum carbide rarely exceeds 35% by weight and that of titanium carbide about 12%. The tantalum carbide grades are larger grained normally because of the greater solubility of the tungsten carbide in the binder alloy.

Many other hard materials have now appeared on the market, which serve many useful purposes other than cutting tools. Boron carbide, with which no binder is used, is the hardest of these, and is useful as plug gage surfaces, contact wear surfaces, thread guides, etc. Unfortunately, it is also very brittle and difficult to braze to its support, and other means must be used to fabricate these items. Special adhesives and mechanical methods of supporting the hard material compact are used quite successfully.

A predominately chromium carbide[14] composition is now appearing on the market and is said to offer unusually high resistance to corrosion and erosion combined with good abrasion resistance. This means that the industrially important tungsten carbide may be released to those applications where its presence is more valuable or where it is incapable of being replaced. The properties of the chromium carbide compositions include:

Composition—83% Cr_3C_2 — 2% WC — 15% Ni
Hardness—88 Rockwell A
Transverse Rupture Strength—100,000 p.s.i.
Coefficient of Thermal Expansion—6.4 (70°-1292°F)

A new series of promising materials, referred to as ceremets, or ceremals, are beginning to appear on the market. These materials are so called because they contain both ceramics and metals. These terms are used rather loosely, as they appear to cover any composition containing a metal and a refractory compound. However, this definition means that all the cemented carbide compositions would also come within this classification. The proposed use of a material of this type in Germany[15], during World War II, as a jet bucket material promoted similar researches in the United States. One series of investigations was devoted to compositions containing substantial quantities of both refractory material, as well as the metal, while another group prepared materials consisting principally of carbides as the refractory material with very small percentages of binder. These materials could be prepared in several ways. One method involved merely cementing the constituents using an extremely fine particle size, while another involved a vacuum sinter or vacuum hot press at very high temperatures which expels a good portion of the binder.

Cutting Tool Applications

Now let us examine the mechanics of the metal cutting operation, in order to more clearly understand the advantages and limitations of the cemented carbides for this most important application. A list of the advantages included:

1. Longer tool life at the temperatures reached by high cutting speeds.
2. Faster metal removal at these increased cutting speeds.
3. Smoother finish.
4. Greater accuracy with less distortion.
5. Harder, tougher and more abrasive materials can be cut.

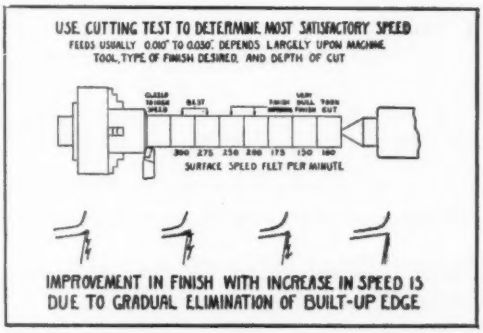

USE CUTTING TEST TO DETERMINE MOST SATISFACTORY SPEED
FEEDS USUALLY 0.010" TO 0.050" DEPENDS LARGELY UPON MACHINE, TOOL, TYPE OF FINISH DESIRED, AND DEPTH OF CUT
300 275 250 200 175 150 100
SURFACE SPEED FEET PER MINUTE
IMPROVEMENT IN FINISH WITH INCREASE IN SPEED IS DUE TO GRADUAL ELIMINATION OF BUILT-UP EDGE

Figure 16

When we speak of a material being machinable, we mean it offers little resistance to penetration of the tool and to the pushing aside of the chip element. An estimate of the energy required to cut a material involves an analysis of a series of rapidly recurring reactions in a segment of the material being cut. This includes the rate at which work hardening is set up in this segment by the forward progress of the top surface of the tool, the rate at which the ultimate shearing strength of the material is reached in a plane tangent to the freshly cut surface, and the temperature effects of the cutting edge.

In the cutting of brittle materials, the stresses will be more variable than those involved in cutting ductile materials. Shear in the cutting segment of a brittle material takes place by a rapidly increasing stress with

APPLICATION ANALYSIS

MATERIAL	APPLICATION	TOOL
1. *Characteristics* Soft Pliable Ductile Brittle Corrosive	1. *Conditions* Temperature Corrosion Pressure Wear Area of Contact Speed of Traverse Tendency to Seize	1. *Carbide Selected* Application Conditions.. Material Characteristics.. Type of Operation
2. *Machinability--Energy to Cut* Hardness Heat Treatment Work Hardening Inherently Hard Shear Strength Rate of Deformation Chip Friction Microstructure Single Phase Polyphase (Stress Raisers) Spheres Lamillae Boundry Segregation	2. *Type of Operation* Continuous Feed Intermittent Depth Alternating Stress Number of Cuts Number of Tools	2. *Rake Angles* Machinability Carbide Toughness Type Operation
	3. *Machine Tool* Single Purpose - Prod. Rigidity Power Range of Speeds and Feeds Adequate Coolant Supply	3. *Nose Radius* Surface Desired Chatter
	4. *Coolant* Purpose Stabilize Composition Control Chip Prevent Distortion Embrittle Chip	4. *Chip Breakers* Purpose Rupture Chips Control Chips Design Type of Chip Feed Depth
	5. *Attitude of Operator*	5. *Positioning* Above or Below Center Minimum Overhang

Figure 17

little or no deformation, followed by sudden rupture. This rapidly recurring stress at very low speeds sets up impact stresses in the cutting tool, which may preclude the use of carbide. The majority of materials in this category do not readily weld or alloy with the hot chips, because of the presence of some inert phase, such as carbides, graphite, or just a natural chemical stability, so that very little cratering of the tool occurs. The front cutting surface of the tool, however, tends to wear quite rapidly when cutting brittle materials, and for this reason the most wear-resistant grades, such as the straight tungsten carbide-cobalt, are used.

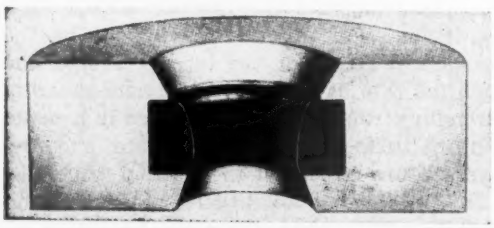


Fig. 18. Section cut through the center of a large wire-drawing die, showing cemented carbide nib encased in a forged steel ring for support.

The very hot and chemically clean, freshly cut surface of the ductile materials are exceptionally susceptible to welding or alloying with pure binder metals, such as cobalt, and thus will undermine the carbide particles in the area behind the cutting edge, eventually resulting in the breakdown of the thin lip of the crater. The presence of titanium, tantalum, columbium, or in some cases vanadium carbides, as alloying constituents in the binder will minimize this action by rendering the binder more chemically inert to the welding action of the hot chips.

The chip coming from a metal in which another phase is embedded, will sometimes act like a brittle material, in that it will tend to rupture more easily and break up into shorter chips. This additional phase referred to may be deliberately added to improve

machinability, or may be formed by heat treatment. This improvement is noticeable only when the second phase is present in large enough quantities in the form of uniformly dispersed spheres, lamella, or as a grain boundary segregation. If the second phase is very hard, but sparsely distributed in a normally ductile matrix, as aluminum oxide in aluminum, or oxide particles in tough pitch copper, the chip may retain its apparent ductility; but, its action on the tool, because of these hard abrasive particles, will resemble that of a non-welding or brittle chip material. For this reason a high carbon steel must be cut with a steel grade when soft, but by an abrasion-resisting grade when hardened.

This change in machining characteristics is a result of the formation of stress concentrations around and near the boundary of a second phase. These stress concentrations, in a structure of this kind, are much greater than the average applied stress. The ease with which shear of successive cutting segments occurs in a modified material reduces the temperature generated by the cutting operation, and thus alleviates much of the welding action of the chip.

Built-Up Edge

The noticeable improvement in the surface finish when machining at high speeds, where carbides are most efficient, is due to a great extent to the gradual elimination of the so-called built-up edge. Figure 16 shows the sequence of gradual elimination of this effect as the cutting speed is increased. This action is characteristic of too low speeds where splitting, rather than cutting, of the material ahead of the cutting surface of the tool occurs. The hot cutting edge of the tool welds readily with the hot, chemically clean, torn fragments of metal adhering to the material just ahead of the cutting edge. These fragments continue to build up until the pressure of succeeding fragments force a part of it to escape before the point of the tool. These more or less evenly-spaced, infinitesimal piles of metal give the cut surface a dull finish. As the speed is increased, as shown in the upper half of Figure 16, a point is reached where the metal does not have time to split before the advancing tool edge, but is actually cut by the point of the tool. In this way there are no metal fragments collected by the point of the tool, and a very smooth surface results. The maximum cutting speed is limited only by the heat resistance and hot wear of the carbide composition. As the speed continues beyond the critical cutting speed, the cut work assumes a glazed appearance resulting from the smearing and welding of the hot clean chip against the work.

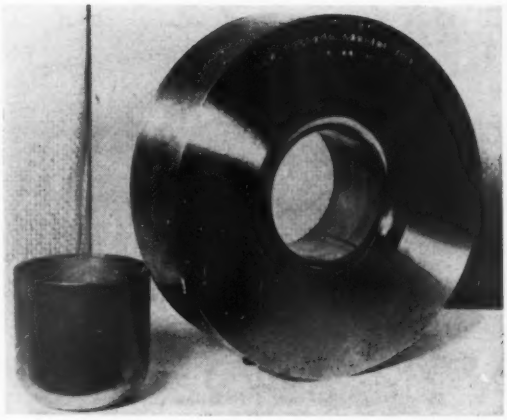


Fig. 19. Deep-drawing die for producing the shell shown at left.

A perusal of the factors contributing to the total heat generated in the cutting operation, which seriously affect the life of the tool, indicates that it is also partly due to the flat rake angles used, or in other words, to the energy required to deform, cut and distort the chip. It also depends upon the area over which chip pressure is exerted, the condition of the tool surface, and the speed at which the chip element traverses the contact area.

In order to stabilize tool compositions and prevent welding and failure at excessive cutting temperatures, with tool materials other than the carbides, liquid coolants are often used. Cemented carbides, however, are usually used most satisfactorily without coolants. Liquids may be used, however to direct the flow of chips in multi-tool set-ups, to prevent distortion from excessive heat, and to quench a stringy, unruly chip in order to embrittle it and force it to break up into shorter segments. Recently, carbon dioxide directed against the tool at high velocities has been used very effectively as a tool coolant to improve tool life.

Rake angles or the three principal adjustable surfaces presented to the material being cut are, to a great extent, dependent upon the toughness and ductility of the material. For the uninformed, "rake" refers to top surface slope. A cutting surface tipped backward from the work has positive rake, while a forward tipped cutting surface has negative rake. If inclined to the side of the tool it

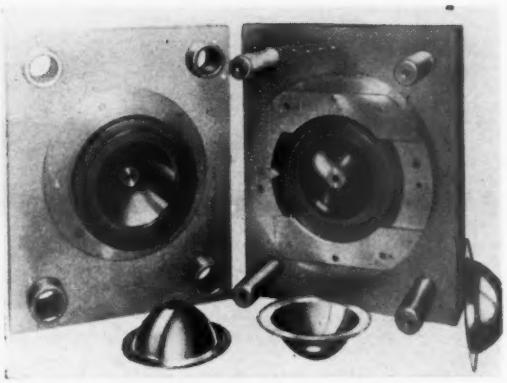


Fig. 20. Carbide die for forming flanged parts shown.

possesses side rake. The more ductile the material, the steeper the rake angles permissible, and the more necessary they become. Obviously, the steeper the rake angles, the less the chip pressure.

In general the rake angles used on carbide tools are more blunt than those used for high speed steels or cast alloys. Negative rake angles are often used to make interrupted cuts, cuts of variable depth, planer applications, etc., which tend to break the brittle carbide cutting edge if positive rake were used.

The chip breaker or chip control groove, cut in the top tool surface, is usually a nuisance to design and maintain. It is valuable, however, when the chips become dangerous to the machine tool operator and must be given direction to dispose of them safely. Their design consists essentially of either a groove or a lowering of a small area of the top surface of the tool by grinding. The depth of the groove, or the degree to which the surface is lowered, coupled with the angle the groove and the shoulder of the lowered surface make with the cutting edge of the tool, is a function of the feed, the depth of cut, and the properties of the material being cut. These chip control devices are also very useful in multi-tool set-ups where the chips must be disposed of to insure their removal from the tool-congested area.

The factors that are important in the control of a machining application of cemented carbides are shown in an outline in Figure 17.

Other Applications

The very severity of the metal cutting operation and the volume of cemented carbide consumed by this phase of industry makes it an importunate subject for any discussion on cemented carbides. However, there are many applications in which cemented carbides have been very successful that do not involve the peculiar set of conditions that are important to the cutting operation. These other applications may be subdivided into other groups, based on their resistance to the conditions imposed by the particular operation.

Pressure and Welding Wear

This combination of conditions may be described as that caused by passing a smooth, relatively soft surface over a hard smooth surface in the absence of a lubricant. This type of wear may be considered somewhat analogous to that encountered in machining, but the operation is not performed at high temperatures or at the higher speeds, and the softer surface is not the chemically clean, hot surface of the freshly cut metal. Typical examples of these conditions are found in the die field, such as those used for wire-drawing, forming, deep drawing, cold heading, etc. The properties of the cemented carbides which make them particularly successful in these applications include their high hardness, chemical inertness and ability to take and retain a high polish. These all add up to a reduction in the sliding friction between the die and work elements.

The cemented carbide die compositions are considerably softer and more impact-resistant than the conventional cutting tool grades, and are given a high polish by the application of successively finer diamond powders. Just as

. . . *Continued on page 60*

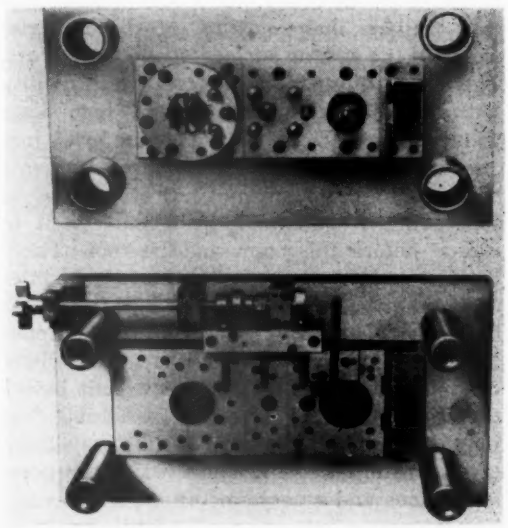
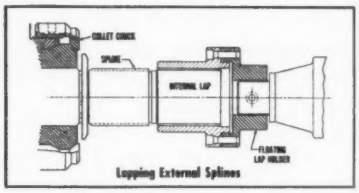


Fig. 21. Carbide die for blanking transformer steel laminations.

Lapping Small Internal Splines

A new method for lapping small internal splines and non-rolling external splines and gear forms has been developed. It permits production lapping of external splines that are of insufficient depth to allow continuous rolling contact with a lap in conventional external lapping machines, as well as production lapping of internal splines so small that it is impractical to make a lap that will roll with the spline.

For lapping the external splines, parts are chucked in an internal lapping machine. An internal toothed lap having the same number of teeth as the spline is mounted in a floating holder on the reciprocating lap spindle. The lap is made with sufficient clearance to slide over the spline.



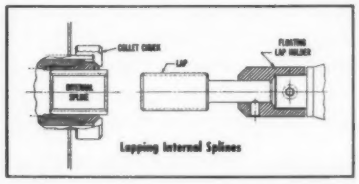
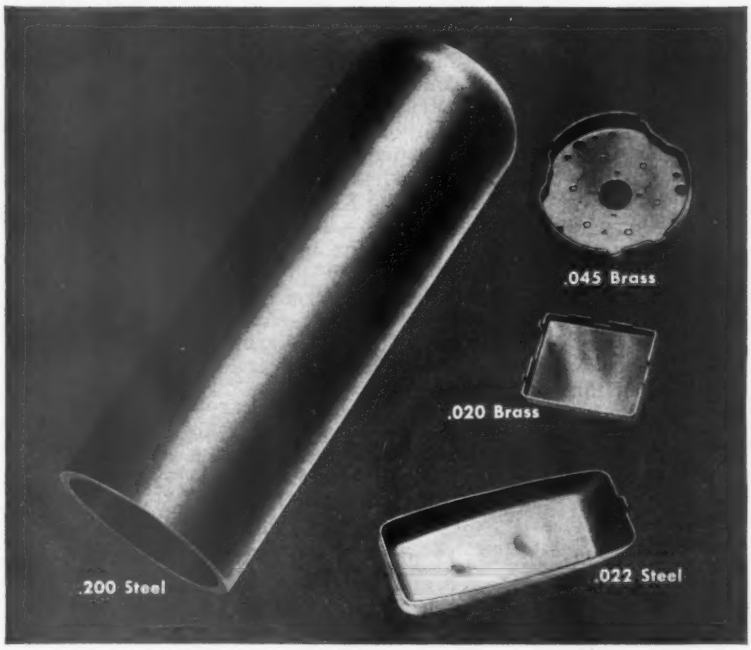


Diagram courtesy Michigan Tool Co.

In operation, the work drives the lap and the lap spindle reciprocates on the work centerline while the work and lap rotate together. The lap spindle is braked hydraulically to give lapping action to one side of the splines. The work is rotated in the opposite direction to lap the opposite side of the splines.

For lapping internal splines, a similar arrangement is used with the internal splined member in the chuck and the external splined member mounted on the lap spindle with a floating holder. Splines as small as 1-in. pitch diameter can be lapped by this method.

ONE Brehm Die
using various cutting adapters



Reduces Original Cost . . . Cuts Operating Costs!

When model or part changes interrupt production, only the cutting adapters of a Brehm Die need to be replaced to continue full production. Don't overlook the fact that a single Brehm Die, using various cutting adapters, greatly reduces the original investment, to say nothing of reducing current operating costs.

The Brehm "Shimmy" Die has angular cams which cause the shearing edges to cut four ways in a single press stroke. Higher production and lower costs are possible because "pinch" and slow, costly "horn" trimming operations are eliminated. Materials, thicknesses, shapes and sizes can vary. Such as gold, silver, plastic, rubber, aluminum, copper, brass, zinc, stainless or mild steel. A refrigerator door, the case of a lady's watch, an artillery case, a business machine, aircraft or automotive part.

Perfect edges, clean, without burrs or distortion at the trimmed edge. Contours can be straight or curved, with single or multiple notches and projections.

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GUIDED MISSILE PROJECT IN CHARGE OF GEORGE J. HUEBNER, JR.

Chrysler Corporation has been awarded a multi-million dollar contract to perform research and development on an Army Ordnance guided missile. The award was made by the Redstone Arsenal in Huntsville, Alabama, and the contract will be administered by the Detroit Ordnance District.

Simultaneous with this disclosure by Brig. Gen. Paul M. Seleen, Commanding General of the Detroit Ordnance District, James C. Zeder, Vice President and Director of Engineering and Research of Chrysler Corporation, announced that George J. Huebner, Jr., who has been Chrysler Chief Research Engineer, will be Executive Engineer in charge of the project.

The program is to be carried on in a portion of the new 2 million sq. ft. Navy owned Chrysler Jet Engine Plant just outside of Detroit. Available here are jet engine test cells and more modern facilities for aircraft engine experiments than are found in older plants, hence it is ideal for guided missile development.

Following his attendance at the University of Michigan, Mr. Huebner entered the automobile business as a student engineer with Ford Motor Company, Detroit, in 1928 and three years later joined Chrysler Corporation's Central Engineering Division as an experimental engineer. Mr. Huebner later became a project engineer and in 1946 was named Chief Engineer of Research. In 1952 he was elected to Tau Beta Pi, national honorary engineering society.

Mr. Huebner said, as of January 11th, that although it was too early to estimate the number and type of personnel that the project will eventually use, it was clear that a considerable number of engineers and technicians of special caliber and accomplishments will be needed.

He emphasized that a major present objective is the developing and organization of specialists in most engineering and technical categories, including not only mechanical and electrical, but electronic, chemical, metallurgical, physical, structures and administrative. Several of the company's leading engineers have been assigned to the project.

The name and the type of the missile to be developed is highly restricted and top secret. Being an Army contract, logical conjecture is that the work will be on either a ground-to-air missile of an anti-aircraft nature, or a ground-to-ground weapon to be used by troops. Guided missile progress is one of the country's most closely guarded secrets, with at least 44 industrial and scientific organizations working under prime contracts in the activity. All guided missile work comes under supervision of the government's Office of Guided Missiles. This organization is headed up by K. T. Keller, former Chrysler president and now chairman of the Chrysler board of directors.

VANADIUM-ALLOYS STEEL COMPANY EXPANDS MIDDLEWEST FACILITIES

Burns George, vice president in charge of sales, Vanadium-Alloys Steel Co., Latrobe, Pa., recently cited mounting business in the Middlewest and a desire to offer a more complete local stock as the primary reasons for the opening of a new Chicago warehouse at 6632 W. Diversey Avenue.

The new warehouse, about two and one-half times larger than the old facilities on Randolph Street, is equipped with modern equipment for the efficient storage and shipment of tool steels. The increased storage space will enable the company to carry a more complete stock of all Vasco tool steel grades. To effectively man the new warehouse, the company's present Chicago staff will be increased under the direction of W. R. Mau, Western sales manager.

The move to Diversey Avenue places Vanadium-Alloys in northwest Chicago which has recently seen extensive industrial development.

. . . Aluminum Stampings, from page 47

multiple cam-pierced and the holes countersunk for convenience in assembly.

Wheel fairings and covers for aircraft brake assemblies, Figure 4, are among parts stamped from CO-Hyblum aluminum 0.051 in. thick, which has to be drawn within a very short time after rolling at the mill before natural aging proceeds far enough to change physical properties more than specifications permit. Such parts present problems also in

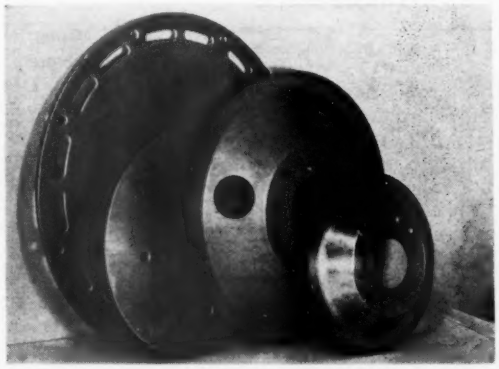

Fig. 4. Many wheel fairings and brake covers such as these are drawn from .051" CO-Hyblum aluminum by The Leake Stamping Company. Similar ones are produced from magnesium alloy sheet stock.

respect to holding close dimensional limits but they are solved by exercising sufficient care in processing and by doing it promptly after the metal is received. Quite similar parts are also produced from magnesium alloy sheet but with some variations in procedure, such as the application of heat to bring the metal to a favorable drawing temperature.

PRODUCTION ZOOMS to 800 per hour

A fast automatic machine with simple, efficient tooling can do wonders in reducing costs and raising production to almost any reasonable figure. In the example illustrated on the opposite page, Cincinnati Application Engineers were working with a very brief milling operation on the end of a shaft. To realize the lowest cost and highest production, they chose a fast automatic—CINCINNATI No. 1-18 Plain—and equipped it with two air operated fixtures with a "hip" control button and a gang of four cutters. Upwards to 800 shafts per hour can be milled on this equipment. ¶ CINCINNATI No. 1-18 Plain Automatic Milling Machines offer several advantages for work of this type. (a) Automatic backlash eliminator for down-milling operations, or alternately up and down milling. (b) Automatic spindle stop protects the operator while reloading fixture. (c) Fast automatic table cycles, with 300" per min. rapid traverse to minimize "cutting air." Other advantages for production milling operations within a 3 hp range are outlined in Sweet's Catalog File for Mechanical Industries. Complete data may be obtained by writing for catalog No. M-1555-2.

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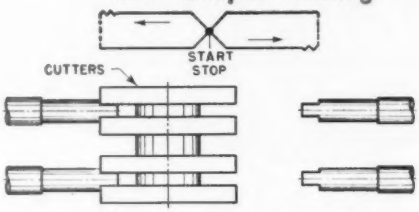
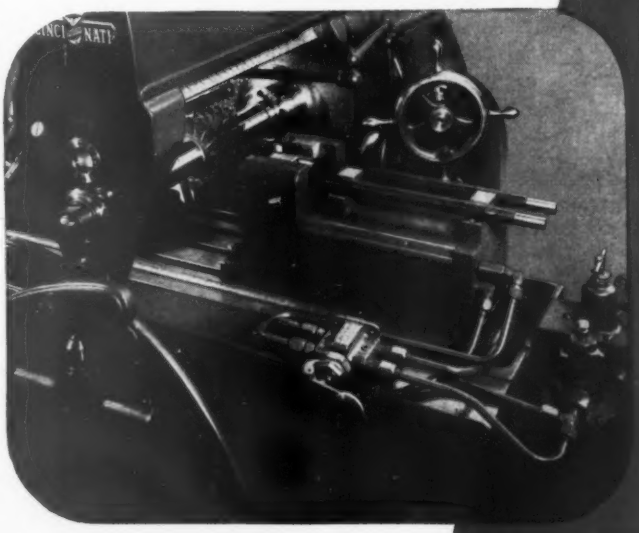


Diagram of setup and automatic cycle.

production data

Part name	Shaft
Material	Steel
Operation	Mill flats on end
Depth of cut	1/8"
Cutters	4" diam. H.S.S.
Production	800 per hour
Machine	CINCINNATI No. 1-18 Plain Automatic Milling Machine



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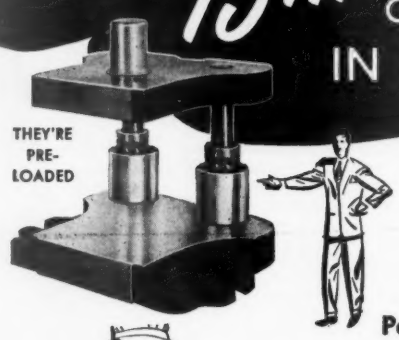

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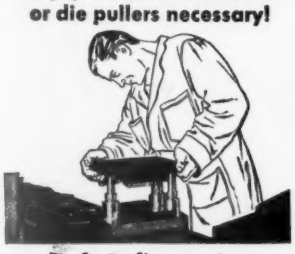

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. . . Carbides, from page 56

in the cutting tool application, the greatest wear will occur at low rubbing speeds. Any rapid change in rubbing speed or sudden, heavy sliding impact involves wear of this type. The use of adequate lubricants further reduces the probability of welding wear by minimizing contact between the rubbing surfaces and providing a slippery film which decreases the coefficient of friction. Figures 18, 19 and 20 show a few examples of this type of application. Figure 18 shows a cross-section of a wire-drawing die with the cemented carbide nib embedded in the steel casing. Figure 19 is a typical deep-drawing die, and Figure 20 is a forming die. Dies of these types have the following advantages:

1. Much longer life (often 25-100 to one).
2. No change in lubricant or drawing conditions is necessary.
3. Closer tolerances are possible.
4. Large reduction in scrap is realized.
5. Product has better finish.
6. Rate of production is increased tremendously.

Abrasive Wear

This type of failure is encountered usually when two hard surfaces rub against one another, and hard particles, as surface asperities, are broken off and carried between the rubbing surfaces. Other sources of the hard particles may be from the material already present in the form of a hard powder, such as in the pressing of abrasive brick, carbide or metal powder parts, and the nozzles of high velocity sand or steel grit blasting nozzles. Typical cases of the wear caused by broken-off hard particles include spinning, burnishing, extrusion, etc. Figure 21 shows a transformer-steel blanking die, which might, at first thought, be placed in the pressure-welding category, but

the type of inert steel used, from which hard particles are broken off easily, makes the failure more characteristic of straight abrasion. A well known application is that of the cemented carbide tipped mortar drill, which also fails by abrasion caused by the mortar or brick powder produced in the operation.

Corrosive Wear

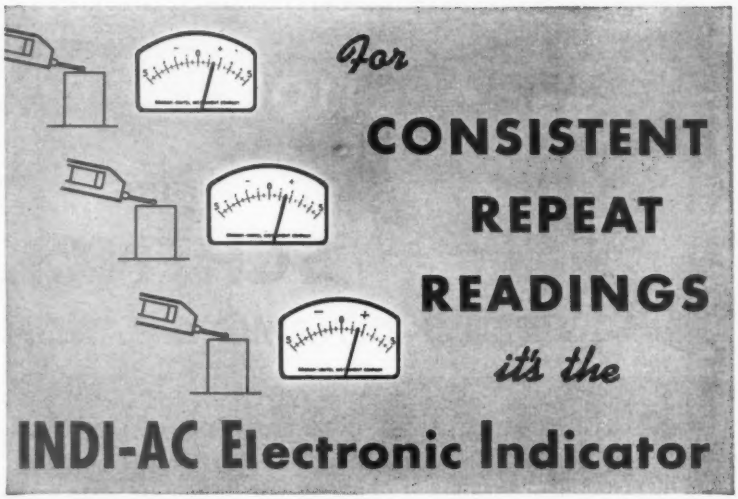
This type of failure is characterized by two contiguous actions, the first being that in which a chemical reaction occurs, forming products which are then swept away by some rapidly moving surface. Corrosion applications in which cemented carbides have been very successful include valve stems for high pressure pumps handling corrosive liquids, and fishing rod guides, which are subjected to the corrosive action of salt water accompanied by the wear of the rapidly moving line. Oil well valve seats must also resist the corrosion and following erosion of crude oil, sand and water. Insecticide spray nozzles are also affected by the alternate corrosion and erosion of the insecticide powders.

Electrical contact points have been made of somewhat unusual cemented carbide[16] compositions containing precious metal binders, such as silver, iridium, osmium, etc. These compositions are particularly advantageous because of their resistance to arcing reactions which are definitely corrosive in nature. Increased life is obtained by decreasing sticking or welding, which is a high temperature function with failure occurring by the increase in contact resistance.

Fatigue Pitting

Fatigue may not always be recognized as a primary source of failure, but may be the basic cause of heading and blanking

. . . Continued on page 64



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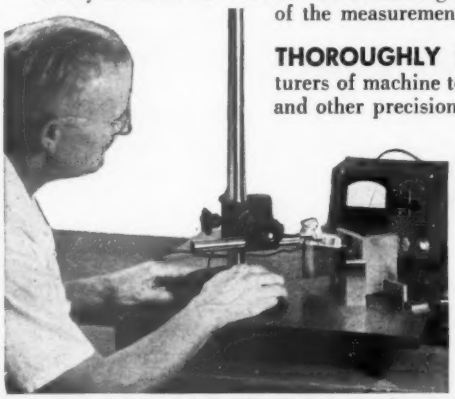

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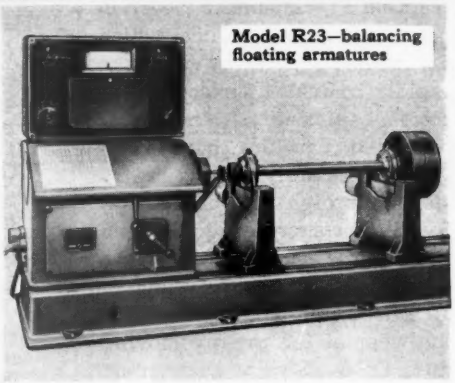
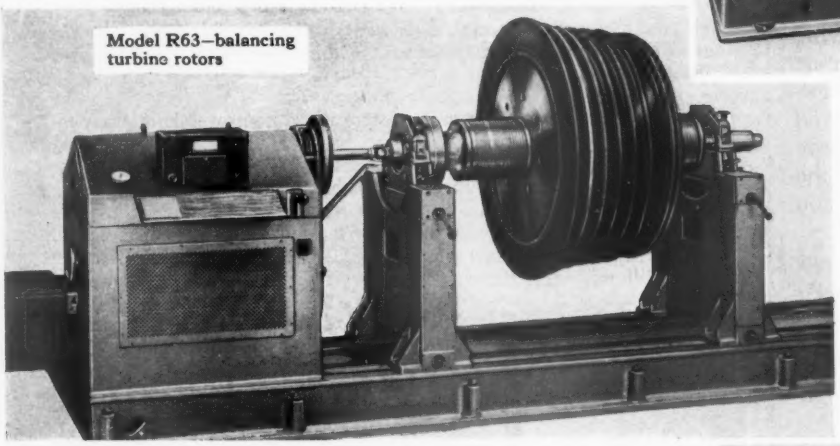


Model R23—balancing floating armatures



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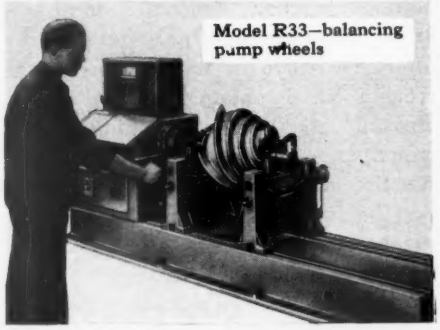

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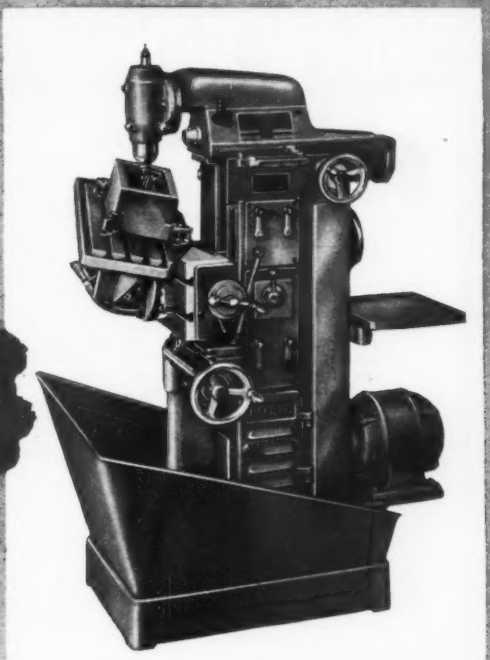

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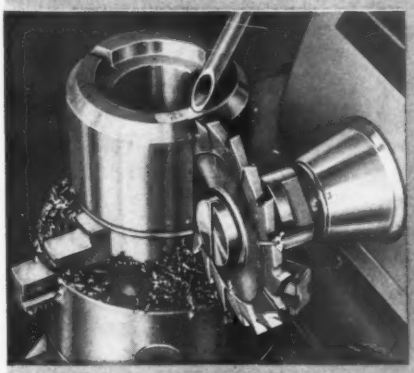
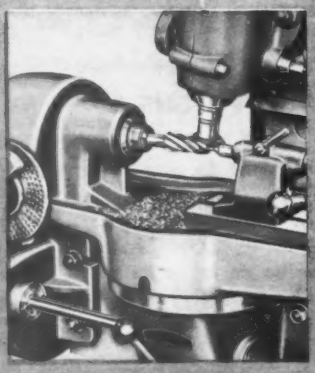
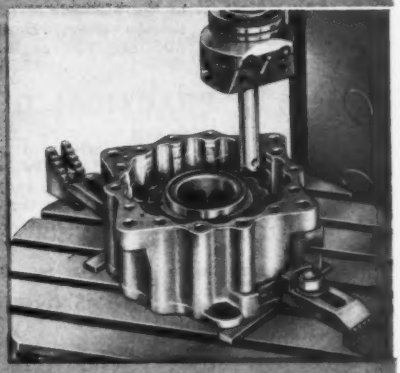
Slot milling using Universal Index Head



Milling flutes of a tapered cutter with Spiral Milling Attachment



Boring a barrel-type pump housing on the FP1 using the Universal Facing & Boring Head and Circular Table with Indexing Mechanism



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. . . Carbides, from page 61

die edge crumbling, and other applications in which a surface may be subjected to rapidly repeated blows. Failure occurs by hardening of the binder metal by the individual blows, whose total energy may be small, but applied over a very small area, is quite large. The fatigue resistance of the binder network will determine the life of the carbide under such repeated-blow applications.

Another interesting application within this category is the carbide - cored armour - piercing projectile whose primary success is a result of its high density, which imparts the great momentum necessary to pass through the protecting armour of the tank or other military vehicle. After passing through the armour, the core is shattered, causing additional havoc in the interior of the vehicle. It is entirely probable that the binder is hardened by the initial terrific impact, and is thus transformed into a potentially fragile structure which shatters readily when coming in contact with any further obstruction inside the vehicle.

In general, then, the factors involved in the simple wear applications involving welding, abrasion, corrosion and fatigue, in which little heat is generated, are somewhat less complicated than those met in the metal-cutting operation. Wear at low temperature depends upon the magnitude of the abrading area, the pressure exerted over that area, and cleanliness, hardness and the chemical affinities of the sliding surfaces.

Conclusion

The applications of cemented carbides have become very widespread, but, because of the many restrictive properties of both binder and carbide, the essential components of the industrial grades have not changed a great deal. It is true that special metallurgical schemes have been de-

veloped to provide greater control and stability over the properties of the final product, but, basically, the chemical composition and manufacturing processes remain the same. The cost and the demand for tungsten, tantalum and cobalt in a vast number of other applications have been responsible for a concerted research for cheaper, less strategic materials for the production of the hard constituents of cemented systems. There are a few other hard materials appearing on the market, as mentioned elsewhere in this paper, which can be substituted for the cemented carbides in certain applications.

The synthetic gem industry, for example, has progressed to the point where the product compares favorably in price with the cemented carbide for wear and corrosion applications. Unfortunately, these materials lack the adequate strength to be used for any but those applications where mechanical strength is a minor factor.

The refractory and very hard oxides, nitrides, borides and silicides[17] have been tried in many applications, but seem to lack the capacity to be wet by any choice of binder material. This very inertness would be a distinct advantage in a cemented system, but the inability to keep the particles bound in a matrix causes the material to decrepitate very rapidly. Hot pressing is often used as a method to utilize these very hard materials for composites which cannot be made by any other means. This is a method which makes up for the lack of the chemical bond by mechanically locking the particles in the matrix.

There have also been many efforts made to devise cheaper, more efficient methods of machining, but these have not as yet been made adaptable to high production. Hot machining[18] certainly has its advantages in min-

. . . Continued on page 132

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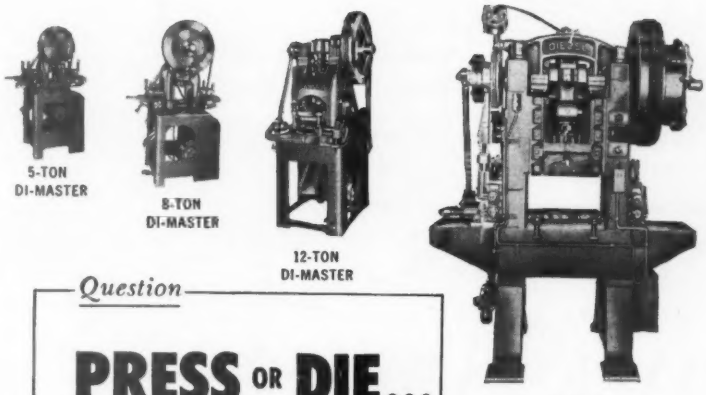

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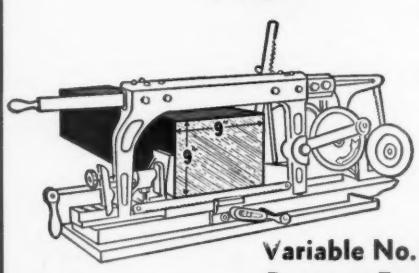

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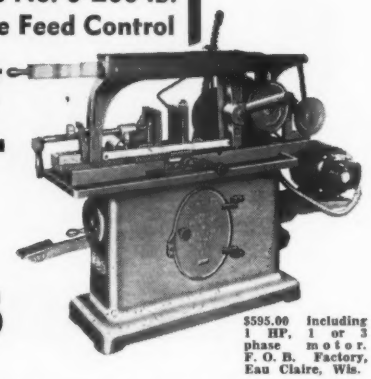

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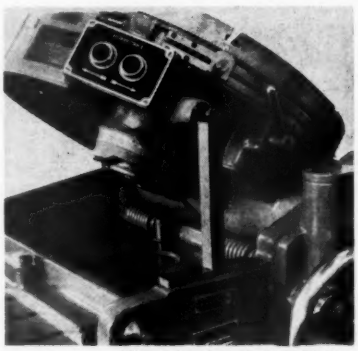
The rotary table can be tilted from 0 through 90°. A rapid elevating hand wheel is provided for fast positioning. Table arc settings are made in degrees using a graduated quadrant on the face of the table pivot. A vernier on this scale subdivides to one minute. For more accurate positioning of the

. . . *Continued on page 78*



Photos Courtesy Pratt & Whitney Division Niles-Bement-Pond Co.

The tilting rotary table is shown here with precision gage blocks placed between the measuring pin and the ground and lapped plate to accurately set an angle to seconds.

FOR PRODUCT INFORMATION USE CONVENIENT INFORM-A-GRAM CARD

Trunnion Fixture Facilitates Broaching

High versatility is the feature of a new special trunnion fixture equipped horizontal broaching machine designed for internal broaching. Indexing, the diameter of the work, and the angle of the cut can all be adapted to the requirements of the work piece.

The machine is basically a standard 10-ton, 90-inch stroke horizontal broaching machine. It incorporates a fixture which allows angular adjustment (15° to 45°) for broaching a wide range of internal angular slots in jet engine segments of various diameters. Variation in diameters are accommodated by changing the internal support ring in the fixture.

An internally mounted rotor in the trunnion fixture is actuated by an index mechanism

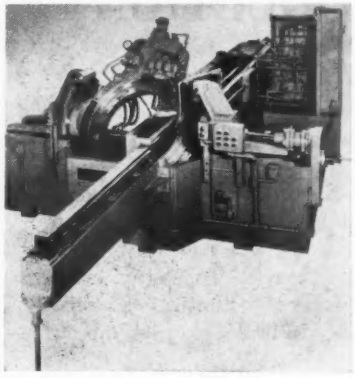


Photo Courtesy Colonial Broach Co.

mounted on top of the fixture. This allows the work piece to be advanced in accurate increments in accordance with the work piece specifications. Angular adjustment is through a worm and segment, with positive locking. Indexing is hydraulically powered through change gears and a Geneva motion, controlled by limit switches, and locked in place by a positive plunger, providing high versatility as to amount of index.

In operation, the ring segment is mounted in the fixture, the trunnion fixture is horizon-

. . . *Continued on page 78*

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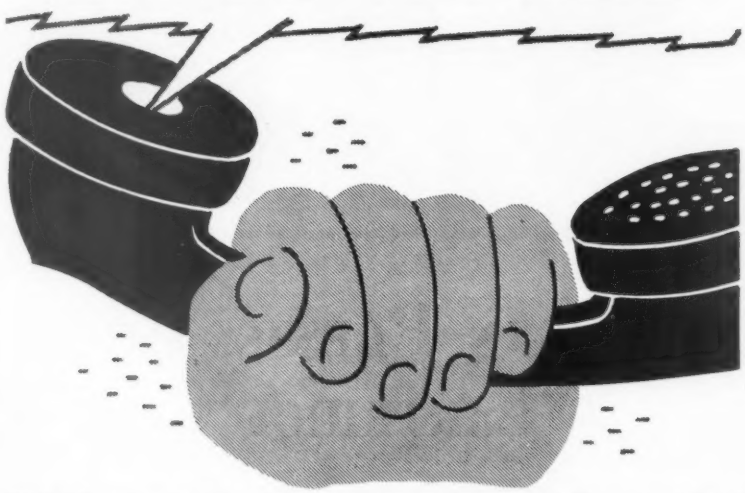

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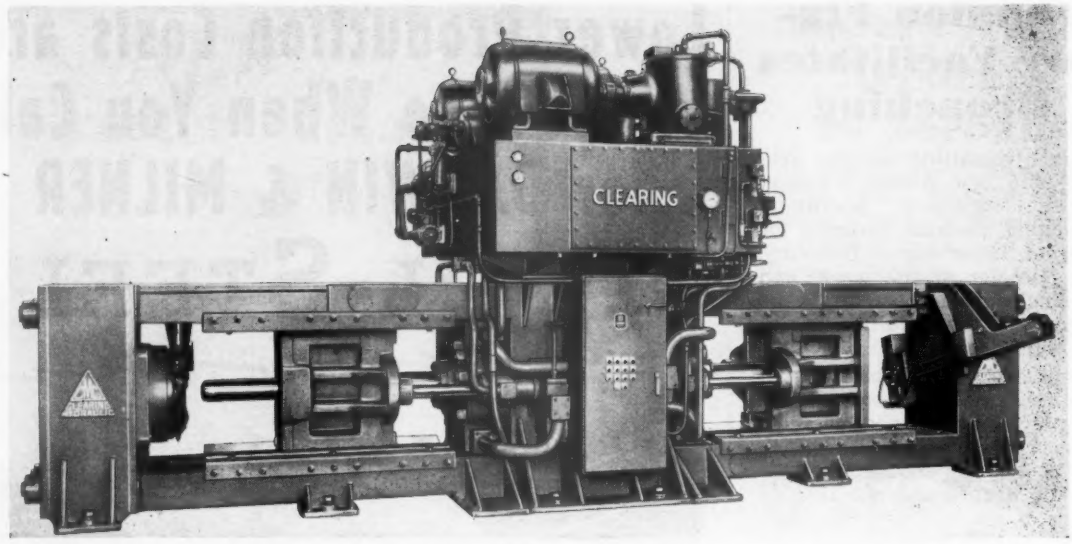
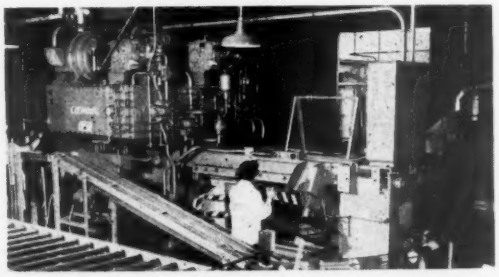
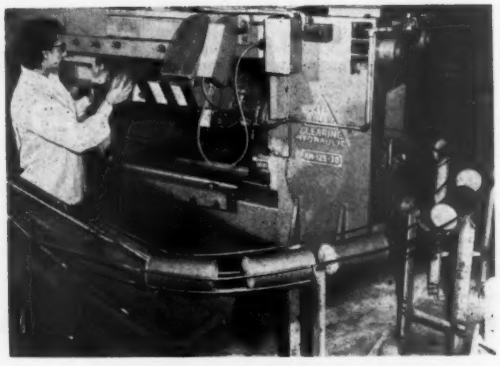


Fig. 1. Typical Double End hydraulic press of the type used in Rheem production of 90-mm steel cartridge cases.

Modern Presses Boost Steel Cartridge Case Production

NEW HIGH STANDARDS for mechanized high production of large caliber steel cartridge cases are being set at the New Orleans plant of Rheem Manufacturing Company. A model of efficiency and modern manufacturing methods, the Rheem production line includes up-to-the-minute double end presses as well as conventional vertical presses. Here, 90-mm steel cases are being turned out fast and accurately.



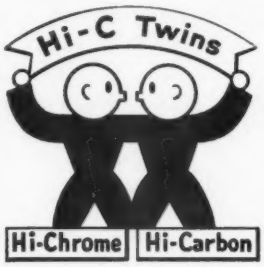


Cartridge cases must conform to the most exacting standards in order to ensure perfect service in the field. Although deep drawn steel cartridge cases are not new, they have met only limited success in replacing brass, the traditional material. It is entirely possible that the continually improving methods of manufacture, together with improved firing techniques and other advances, will permit steel cartridge cases to be more than an emergency substitute for brass cases — in certain types of ordnance at least.

A major factor in the Rheem success story is the development of a Clearing hydraulic press that greatly reduces the normally lost time experienced in drawing a case to its final length of 24". On a conventional press, the long return stroke is lost time that slows down the total cycle time. Presented with this problem by Rheem, the Clearing engineers conceived the idea of a double end hydraulic press, one which would produce at both ends of the stroke.

. . . Continued on page 140

Fig. 2. Workpieces are loaded into the feeding chute for the second draw, which requires 100 tons, reducing the area about 4% and wall thickness approximately 44%.



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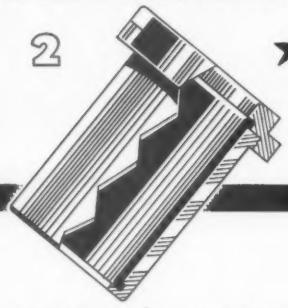

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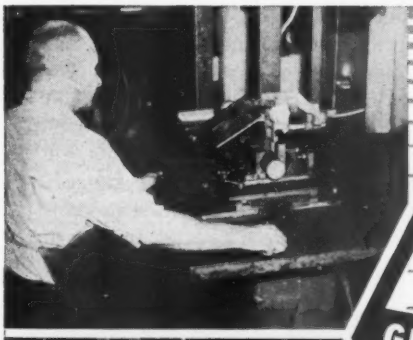

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. . . Hardness Testing, from page 51

In making Brinell tests, it has been the usual procedure, where specimens were prepared from rough stock, to dress the surface with a file, and then polish it with emery cloth, although some do not go to this much trouble. However, direct-reading Brinell machines are now available which require no surface preparation and which allow Brinell testing to be stepped up in line with other production operations. One machine of this type is equipped with two dials, one directly above the other. Tolerence hands are set to desired limits on the lower dial, and the operator simply notes that the indicator point stops within these tolerance hands.

Since no grinding or preparation of parts is required, a single operator can complete tests as rapidly as he can handle the work. Foot operation allows him to use both hands on the work. The direct-reading mechanism is hydraulically-operated, is positive, and works equally well on round or flat work. The piston of the unit is long and self-guided. Such machines are available with a double-load feature. Either of the two loads may be used as required. On such testers selection between the two different loads is made by means of a small lever on the outside of the machine. A further modification in such machines can be made, which allows direct reading on tubular or other parts which are ordinarily subject to distortion while under test.

Photo courtesy Tinius Olsen Testing Machine Co.

The Brinell hardness tester here shown is actually a precision hydraulic press with a downward-acting ram which applies the load throught the ball support to the ball indenter. The load is quickly and easily applied through a small hand-operated hydraulic pump. The photograph shows an actual part being hardness tested. Note that 3000 kgs has been applied to the specimen by the operator.

Some hardness testing machines of the Brinell type are particularly adapted to conveyor or line work because their table remains at constant height regardless of work size. Various makes of these testers also incorporate a direct reading feature. Some of them have a dial hand located on the end of the test ram.

Aspects of Dead Weight Machines

Where Brinell testing machines operate on the principle of dead-weight application, it is important to insure that the weight function be properly transmitted to the ram. In this connection, slotted weights are often employed. Where this is the case, it is important to stagger the weight slots radially, so they are evenly distributed, thus keeping the mechanism in proper balance. Some firms providing Brinell testing machines of dead-weight type furnish a leveling table, to insure free working of the controlling-weight attachment involved. The table has four adjusting screws. these allow perfect leveling of the machine.

It is not recommended that too much dependence be placed on any calculation of tensile strength directly from the result of a hardness test. However, some find it convenient to estimate tensile strength thus for practical purposes. Some authorities suggest that tensile strength may be assumed as one-third of the Brinell hardness number in metric units. Some suggest multiplying the hardness numerals by the co-efficient .346 as a uniform constant, whereupon the result obtained will be ultimate tensile strength of the material in kilograms per square millimeter. Kilograms per square millimeter may be converted to pounds per square inch, simply through multiplying by the factor 1422.3.

One very convenient portable hardness tester is equipped with hand grips on both sides, by means of which it is pressed down on the material to be tested. The penetrator in this instrument is actuated by a cylindrical spring, which exerts a constant load of 15 pounds. The arrangement is such that the base of a liquid-filled chamber is compressed as the penetrator acts against the metal. This causes the liquid to move into a capillary tube.

. . . Continued on page 72

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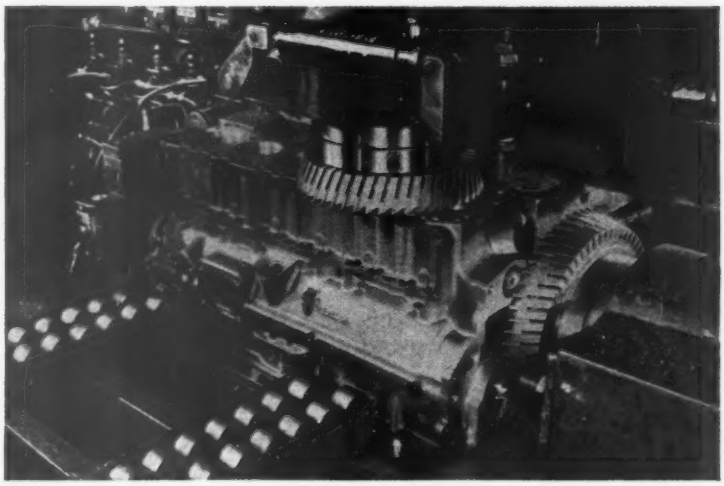

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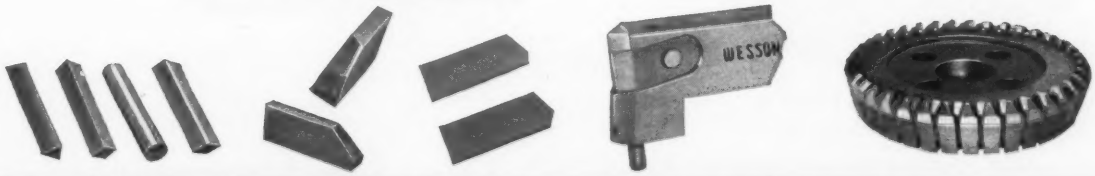

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. . . Hardness Testing, from page 70

The capillary tube leads up and around the dial of the tester. The point at which the liquid stops flowing may be read on this dial. This point indicates hardness of the material tested. Liquid in the tube is green, which greatly facilitates reading it readily. Different circular scales may be applied to this instrument, including calibrated scales for Brinell and Rockwell testing.

Portable Unit has Three Ball Penetrators

One highly interesting and versatile portable Brinell hardness tester is capable of being fitted with three different sizes of ball penetrators, separately mounted and interchangeable. This allows tests to be made with a 2.5 mm, 5 mm, or 10 mm ball, respectively. This provides an extremely wide range. Further, this particular tester may be provided with three styles of holders or shanks, readily adapting it for use in an ordinary vise or carriage clamp; in an arbor press; sensitive drill; or any other machine tool.

Tests can be made directly with this instrument on rolls or molds, etc., during machining operations, if it is desirable to investigate the nature of successive depth after each pass of the milling cutters, turning tools or grinders. Using this instrument, tests can be made in locations on eingine and machine parts hitherto inaccessible. While primarily a Brinell tool, the tester may be provided with an auxiliary unit, which allows Vickers tests to be accurately made with a diamond pyramid indenter. Another auxiliary unit is also applicable by means of which the instrument becomes a valid indicator of hardness in hardened steel and alloys far beyond usual Brinell limitations.

An interesting proposition concerning Brinell hardness tests is the fact that one firm has developed and incorporated a rotating ball-mount. On Brinell tests where indentations are more shallow, the curve of concavity lessens. It therefore becomes more difficult to distinguish the contour which must be measured. With the rotating ball-mount, a slight rotation of the unit (not more than 30 degrees) after diminishing the applied load, polishes the cavity made, so that its definition is positive and therefore easy to evaluate.

With the auxiliary used for this purpose, hardened steel is easily tested, and Brinell values up to 800 are exactly indicated. It is recommended, in connection with the use of this auxiliary, that after applying required load for 30 seconds, until flow of metal ceases, the load be relieved about 30%. Then, rota-

. . . Continued on page 106

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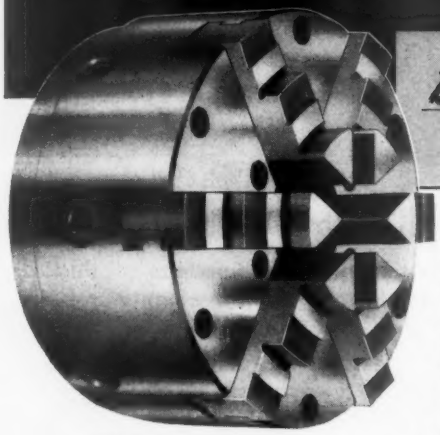

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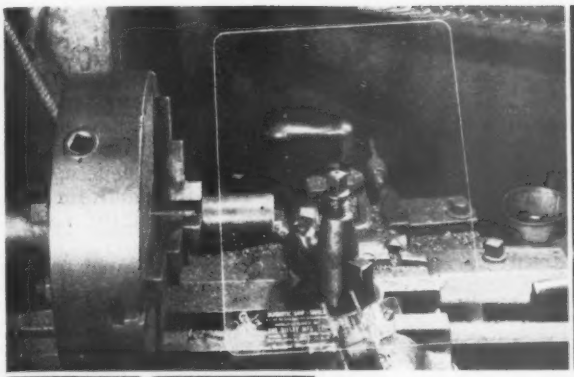

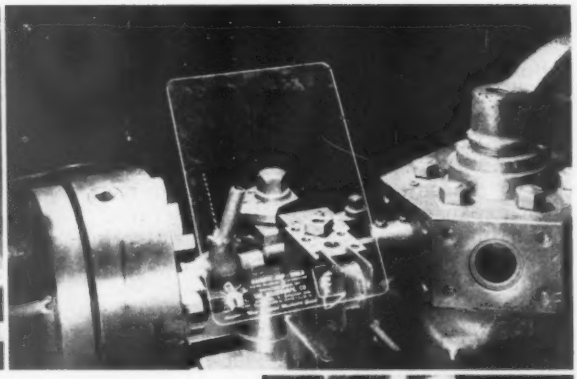

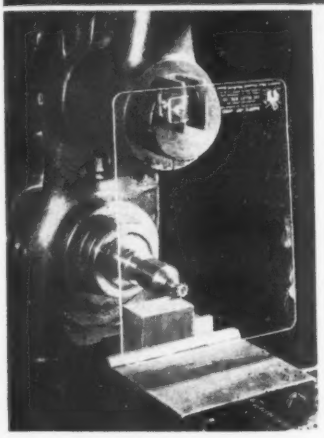

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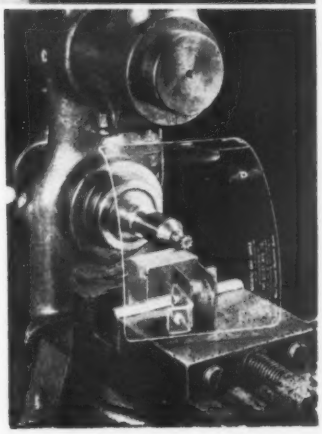

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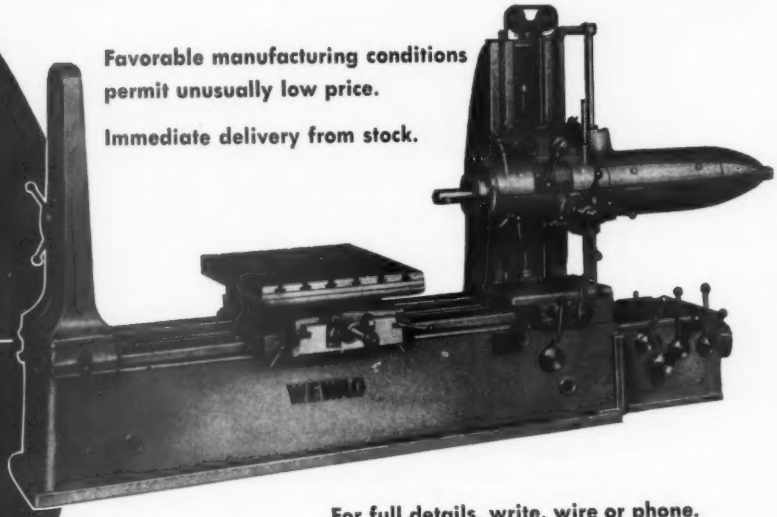

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$10,000,000 Three-Year Expansion

Building what amounts to a new plant in and around its existing structures, Standard Pressed Steel Company is rapidly pushing to conclusion a $10,000,000 machinery and new plant expansion program.

Starting in early 1950, SPS began razing some of its older buildings, removing the walls of others, and tying in more than 325,000 square feet of new plant to its present operations. When the program is finished in mid-1953, SPS will have more than 650,000 square feet of floor space integrated under one roof, housing the manufacture of all products — Unbrako socket screws, Flexloc self-locking nuts, Hallowell steel shop equipment and also aircraft specialty parts.

The project is a ten year expansion program telescoped into three years. It includes new plant construction, modernization of equipment and facilities, the building of ultar-modern employee locker and wash room facilities, and the development of nine acres of land for employee and community recreation and parking.

"The modernization," points out SPS president H. Thomas Hallowell, Jr., "is the result and indeed a concrete justification of our policy of plowing back 80% of profits into the business.

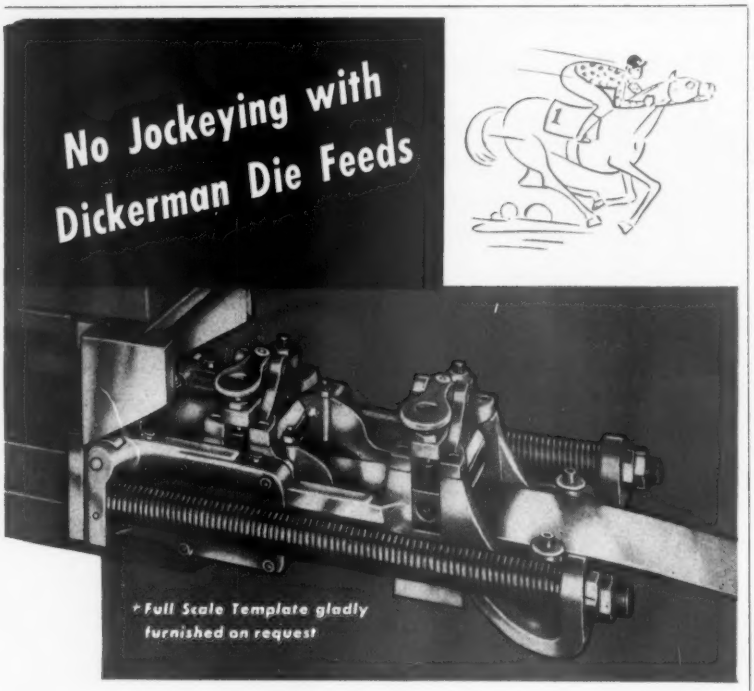
The goal of SPS was to more than double existing production space—and in doing so to create an efficient plant shell that would permit flexible re-layout of production processes and the utilization of modern materials handling techniques. SPS achieved its goal without building an entirely new plant and without losing a day's production time in any of its departments.

As SPS grew over the years, it added new buildings to its plant capacity. By 1950, the company found itself with 325,000 square feet of floor space scattered throughout many individual buildings. At every attempt to expand production, change layout or improve materials handling flow it met confining walls and corners.

This lesson learned, the new plant facilities were designed with a minimum of walls. Where possible, existing walls and corners were knocked down and adjacent buildings joined. Almost 150,000 square feet of new floor area was built right in the middle of the plant with no side walls at all. These areas were joined directly to existing structures.

The result has been a new freedom for plant operations—a new production psychology. Departments badly in need of it have been integrated, and materials flow greatly improved. The unconfined expanse of the new plant has permitted the company to completely re-layout its operations, and will in the future provide the built-in flexibility needed to shift machines and processes to meet changing production demands.

A total of three rail sidings, two of them new, give SPS complete mobility for entry of raw



Set-up men and press operators all know how critical starting a new coil can be into a complicated progressive die. Smash-ups at this point are costly both in down time and die repairs.

No need for both hands on the On and Off Control Buttons to "jockey" a new strip into position with Dickerman Die Feeds®. On single trip or automatic operation, the feed advance is positive and accurate. Adjustments made for single trip operations when feeding a new coil or developing a new die, remain constant when the press is switched to automatic operation.

Experienced tool design and production men find this an invaluable feature of Dickerman Die Feeds® in addition to their dependability and accuracy.

Write Dept. C for photographs showing variety of work fed with Die Feeds . . .

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materials and exit of finished products. Materials enter the north side of the plant by rail and truck. Finished products leave either half way through the plant via a new rail spur, or at the south side of the plant via a new modern rail and truck loading platform.

Reorganization of materials handling in the press shop has permitted SPS to cut handling costs 50-75% with a concurrent increase in output of 50%. Heart of this program has been the relayout and extension of the company's overhead chain conveyor and the addition of 40,000 square feet of floor space. Now, 3000 feet of overhead conveyor carry component parts of press shop equipment in continuous travel through washing, drying, painting and baking operations. The conveyor then delivers finished parts either to one or two rail sidings for immediate shipment, to component assembly or to a balcony storage area.

Re-layout in the press shop has permitted an increase in conveyor speed from 8 to 15 fpm, and has cut by 90% the distance formed metal has to move from storage to welding assembly.

In fastener production a reduction of almost 40% has been made by similar methods in total travel of material, and in addition the last five operations —plating, inspection, magnaflux, packing and shipping — have been tied together by roller conveyor.

In all, 1600 feet of new belt and roller conveyor will have been added to the SPS plant when completed. Packing, weighing, and shipping of screws will be completely conveyorized. All fastener packing will feed by conveyor to the new shipping platform. Increased use of conveyors at inspection stations will cut quality control costs and improve inspection efficiency by eliminating fatiguing handling.

An underground, completely automatic coolant system has been installed to provide clean coolant to a battery of 60 centerless grinders. This recirculating system cleans and aerates machine tool coolant. It takes up no valuable floor space and eliminates the need for servicing each machine individually.

A new scrap handling system built around a crusher and a centrifuge enormously speeds scrap disposal, recovers 30% more oil from the chips, and increases the value of scrap at the steel mills by four dollars a ton. Plating room wastes are discharged through a new $153,000 waste treatment plant. This plant processes chromic acids, cyanides, metallic plating solutions and quenching oils. It discharges a clear, harmless effluent into the community stream.

The most modern fixtures and furnishings have gone into the company's new employee locker rooms and washrooms. To begin with, both as a convenience for its workers and as a production aid, SPS ran the pipe to the employees. The company constructed washrooms and toilets right out in the production areas where they could be quickly reached in a minimum of time. The washrooms are constructed without open doors to discourage loitering, and have had the successful effect of eliminating afternoon siestas. Outside, better than $100,000 has gone into creating new and improving existing recreation facilities.

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Just One Chuck Required for Cutters from 2" to 6" Diameter!

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MEN YOU SHOULD KNOW . . . . . .

Fred L. Pritchard

Howard K. Jackson

Warren T. Spofford

Gordon T. Rideout

David H. Paul

Mr. Fred L. Pritchard, of the Brown & Sharpe Mfg. Co., Providence 1, R. I., has been appointed the company's representative in its Cincinnati office. He comes from the Detroit office, and will assume full responsibility for his new post on April 1, 1953.

◆

Mr. Howard K. Jackson, who has been on special assignment for the company in Cincinnati, will retire on the same date after thirty-four years service with the company.

◆

Warren R. Spofford, abrasives engineer, takes over a new metropolitan Boston territory for the Norton Company. Gordon T. Rideout, formerly sales engineer in the Worcester office, has been appointed abrasive engineer and will take over the Worcester County territory replacing Mr. Spofford. David H. Paul, formerly abrasive engineer in Arkansas, western Tennessee, Mississippi and Louisiana, who recently returned to the company after serving fourteen months with the U. S. Navy, has been appointed field engineer in the Philadelphia district. These three appointments were recently announced together with two reassignments by Ralph M. Johnson, vice president in charge of sales, the Norton Company.

Ex-Cell-O builds a complete line of tool grinders for sharpening high speed steel, cast alloy, and carbide tools. All are double-end grinders with generously proportioned tool rest tables, and all are equipped for face grinding on cup type wheels. For accurate finishing of small tools or for fast metal removal on large tools there's an Ex-Cell-O Tool Grinder to suit your needs. They are described and illustrated in Bulletin 46262. Write to Ex-Cell-O in Detroit today for your free copy. No obligaton, of course.

51-3

EX-CELL-O CORPORATION DETROIT 32, MICHIGAN

. . . . . MEN YOU SHOULD KNOW

William O. Sweeney

Denny White

Gene Brill

Warren S. Gardner

Paul F. Aaron

The Arwood Precision Casting Corporation of Brooklyn, New York announces that on February 1, 1953 Mr. William O. Sweeney joined their organization as assistant vice president of sales. He was previously associated with Union Carbide and Carbon Corp.

◆

Denny White, assisted by Gene Brill, will direct the new Pump and Filter Division announced by the Truman E. Longley Company of Cleveland, O. The division will handle sales and service of supplies applicable to plant engineering and equipment maintenance. White was formerly field engineer for the Shell Oil Co. and division engineer for the Amco Corp., Cleveland. Brill's technical training at Case Institute of Technology is backed by six years field experience.

◆

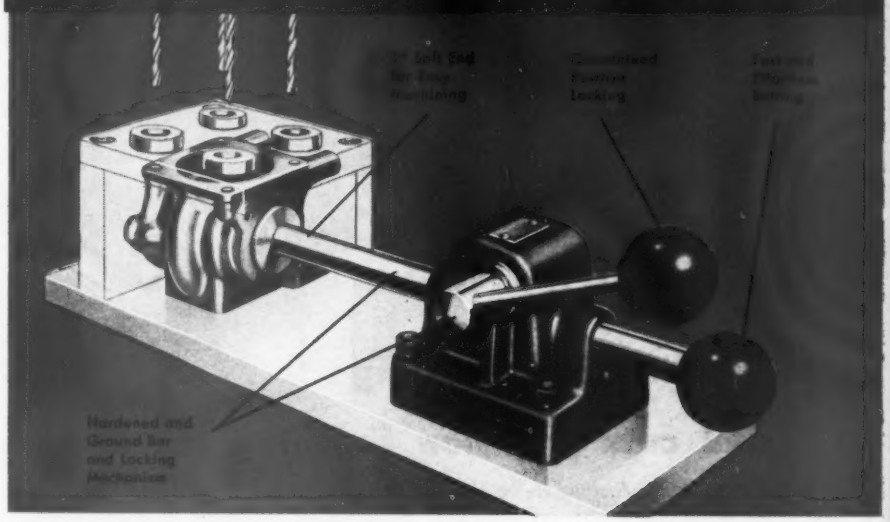
Warren S. Gardner, Jr. has been appointed southern representative for Bay State Tap & Die Company. His territory will cover the states of Virginia, No. Carolina, So. Carolina, Georgia, Alabama, Mississippi, Tennessee and Louisiana.

◆

Mr. Paul F. Aaron, previously connected with Crosley Div., Avco Corp., at Richmond, Indiana, has been appointed plant manager of the Cincinnati Tool Company of Cincinnati. He will have complete charge of production planning.

AMAZING heinrich FIXTURE LOCK

BOOSTS PRODUCTION . . . CUTS TOOLING COSTS



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Enjoy savings up to 75% on tooling costs using "Grip-Master" Screwless Drill Press Vises. Instant action; just a press on locking lever and "Circle-Grip" mechanism provides a hold that hammer blows cannot break! Hardened, precision ground for long service.

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and cuts precision finishing costs

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Further proof of the results obtained with a Liquamatte is the installation at the Oling Tool Company. Here, the Liquamatte is saving an average of 50% on former time and labor requirements for surfacing tools prior to plating. On some items such as drill bits, savings as high as 80% have been effected.

The 14 advanced design features of the Liquamatte can cut your costs too. *Bulletin 43 tells how. Send today for your copy.*

American
WHEELABRATOR & EQUIPMENT CORP.
852 S. Byrkit St., Mishawaka, Indiana

LIQUAMATTE WET BLASTING

. . . Rotary Table, from page 66

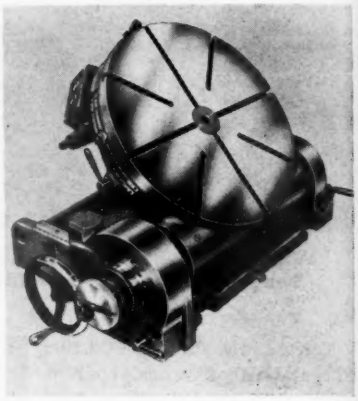

table arc the sine bar method is used. This method involves setting up a simple triangulation problem and using the desired angle to solve for the unknown height of the triangle. Precision gage blocks equal to this height are then placed on the ground and lapped platform and the table lowered until the measuring pin on the table bed touches the top of the gage blocks. Accuracy in seconds up to a 45° elevation can be accomplished in this manner.

The design of this new tilting rotary table is exceptionally compact with very little overhang. Thus the table can be used on large flat surfaces without the necessity of much build up.

The table is equipped with simple, positive lever binders thus eliminating the need of wrenches.

. . . Trunion Fixture, from page 67

tally shuttled into broaching position, and then the broach cuts a slot. The fixture recedes from the broach cut, the broach is returned, and the part is indexed one increment. The fixture then returns to broaching position, and the process is repeated automatically until all slots are broached. The rapid traverse then rotates the part automatically to the loading and unloading position. Part is ejected pneumatically. Selective electrical circuits are provided for fully automatic operation, single indexing, or independent inching motions for all hydraulic units, including both forward and reverse.

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Streamlining Technical Drawings

Streamlined industrial drafting is being used by the General Electric Company as one means of combating the skilled manpower shortage. The more than 5,000 draftsmen employed by the company are being encouraged to strip the frills from their drawings, and are saving between 20 and 50% of their time.

Substantial savings in other related operations are expected as a result of the switch, and at the same time it is anticipated that the need for additional manpower will be reduced and more time will be available for the most important part of any industrial draftsman's job—productive creative thinking.

Draftsmen make the drawings from which manufacturing departments produce the finished product. Simpler drawings are expected to lessen the time required to read them and effect a saving in those departments. Simplification and elimination of non-essentials in drawings and layouts is being done without surrendering either clarity of presentation or accuracy.

The new ideas on modern industrial drafting are being presented to all the company's draftsmen, from the old-timers to the youngest apprentice. Experts under the company's drafting services section are going from department to department and hope to have covered the whole company by the middle of the year.

Many of the methods taught in simplified drafting are not entirely new. They have been advocated for ten or more years, but only recently were they wrapped up into an attractive program that was easily presentable and more readily understood. The manpower shortage gave impetus to the program. A study of the problem suggested that the company must help itself by analysing operations and rearranging essential work to remove non-technical details from the daily tasks of technical people. Experience shows that science students, high school graduates or skilled technicians can be trained to do many of the details that might be bogging down top-flight scientists.

It was further suggested that designers and draftsmen drop the outmoded textbook practices and artistic drawings with their superfluous lines and use today's streamlined industrial drafting techniques to produce quicker results.

The men working on this simplified drafting program have found that drafting organizations have been so engrossed with product design and development that they have not realized their drafting practices have lagged behind the general trend of industrial progress. They see no reason for yards of drawings when a few feet will serve the purpose.

In addition to the savings in manpower there is a definite saving in the amount of materials and facilities. In one instance, a drawing which required 57 square feet of drafting paper was replaced by one with less than 4 square feet without losing clarity or accuracy.

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DETROIT DIE SET ★

General Electric drafting departments use more than 75 million square feet of drafting paper a year. Under the simplified plan it is indicated that more than $60,000 a year may be saved in paper cost.

The drawing which was 57 square feet in size required eight days of one man's time while the less than 4 square feet of drawing required only two days for one man, a 75% saving.

Although modern industrial drafting embraces many economical practices, three of the easiest and yet most effective which can be applied immediately to reduce the time and effort to make drawings are being encouraged, the company said.

Simplification of delineating, elimination of non-essentials, and extensive use of free-hand drawing are being encouraged. In the most simple terms, simplification of delineation and elimination of non-essentials means merely eliminating those things which contribute nothing to accuracy, completeness, or clarity.

Extra views, unnecessary elaboration, superfluous lines, repetition, and conventional representation instead of symbolism are but a few examples of work that should never have been done. The direct way, the simple way, are encouraged as the best way.

Exponents of the simplified drafting program are selling the idea that planning, production and manufacturing people are not the least bit interested in fancy drafting techniques nor beautifully executed time-consuming layouts. What they want is complete, concise, accurate information at the proper time.

If a description will suffice, then a drawing is not needed and the draftsman is not urged to draw one. In connection with this, some General Electric drafting departments have adopted the slogan, "A superfluous line is a waste of time."

The draftsmen are being cautioned that the use of short cuts or abbreviated methods does not relieve them of their obligation to draw clearly, legibly, and in a manner easily understood. Simplified drawing is not a license for sloppy work.

Another modern and time-saving drafting practice which the company's draftsmen are being encouraged to use wherever possible is the extension of free-hand drawing beyond its present narrow limits. Tests have proved that free-hand drawing, when used judiciously, is both practical and economical. Other factors equal, actual drawing time is reduced 20-30%.

Throughout the program, this point is being stressed — the really important part of any draftsman's job is thinking—the picture making part is least important. Industrial drawings are only a means of conveying thought to others. Less time spent on the actual making of the drawings or pictures means more time available for the real productive effort of creative thinking.

W. L. Healy and Arthur H. Rau are authors of a book entitled "Simplified Drafting Practice — A Modern Approach to Industrial Drafting," which has been scheduled for publication early this year by John Wiley & Sons, Incorporated.

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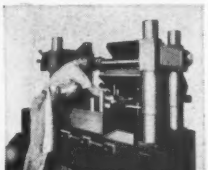
NEW ALPHA 100 TON DIE TRYOUT PRESS

YOU CAN blank, spot, shear, fit and finish both die and punch WITHOUT REMOVING the DIE. "Tryouts" take less time because the press is open on all four sides, giving easy access to the die and punch. The head can be quickly released and rotated to any point up to 240°. This new press is compact, being 82" high and occupying only 75" x 84" of floor space. The rugged construction of the Alpha 100-ton die tryout press assures years of trouble-free service.

The top die in position for altering.


It's easy to work on the bottom die.

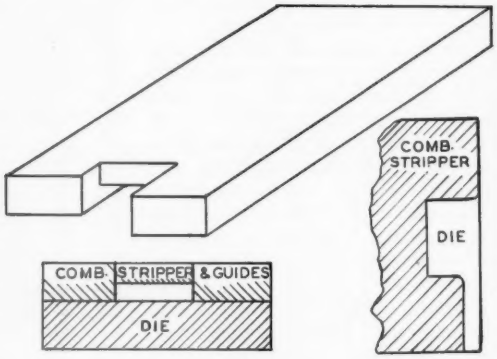
Send today for your free folder. It gives all the details about this remarkable press.

ALPHA TOOL WORKS
9281 Freeland Ave.
Detroit 28, Mich.

. . . Strippers and Guides, from page 43

The One Piece Fixed Combination Stripper

This one piece fixed type combination stripper and stock guides, shown here with a starting entrance, is more frequently found on the high precision type of dies than are the strippers previously described. Usually this stripper contains drill jig bushings for guiding small punches. The trough for the material, the stock entrance and the punch hole openings are customarily machined in one setup which assures the accurate relationship of the guides to the punch hole openings, or die progression. If the diemaker fails to mount this type of stripper accurately on the die block, all the accuracy built into the



stripper is wasted. In the use of such a stripper, the stock width must always be within the permitted tolerance otherwise the guide trough would have to be remachined to accommodate wider stock. Once wider stock is used, stock of the original width can not be run again without correcting the stripper opening. Constant changes in stock width plague every pressroom, but for economy's sake and efficiency this condition must be accepted. The style of entrance shown here should be employed on all fixed strippers in order to assist the press operator in accurately locating and starting the strips into the opening with less effort and fatigue.

Kennametal Appoints Die Sales Engineer

Appointment of Norman W. Oberg as a die sales engineer has been announced by Kennametal, Inc., Latrobe, Pa. Mr. Oberg has been engaged in diemaking activities for more than 15 years, having at one time operated his own business in Tarentum, Pa.

He comes to Kennametal from Firth-Sterling, Inc.; was previously associated with other leading industrial concerns. He will operate from the main Latrobe plant.

Diamond Grinding Wheels Conference

Fourteen manufacturers of diamond grinding wheels are in agreement that the supply of diamond crushing bort is in a "very delicate" balance with demand.

At a recent special conference with officials of the National Production Authority, Department of Commerce, they admitted uncertainties surround the future supply of diamond bort, especially if defense production should be intensified.

A crisis in the imported supply of diamond bort and powder arose early in 1951, but shipments in 1952 improved the domestic supply and users of diamond grinding wheels now have a 60-day inventory of such wheels. Consumption of bort now is exceeding imports, however, and inventories of the raw material are further receding, NPA was told.

The manufacturers said deliveries of diamond grinding wheels proved adequate to meet American industrial needs in 1952. They agreed deliveries in 1953 also will be adequate if conservation and salvage are rigidly practiced.

The conference emphasized the necessity for increased conservation of diamonds, recovery of diamond grain and reduction of waste by more efficient operation of the diamond grinding wheels. They cited the need for a more durable bond for the diamonds in wheels, avoidance of overheated wheels and of excessive pressure of wheels on surfaces being ground, proper speeds of the wheel and the saving of grinding swarf or sludge.

The meeting developed into a lengthy discussion of the relative merits of diamond wheels and silicon carbide wheels. The manufacturers stated that American industry has been falsely led to believe, by some newspaper and magazine articles, that diamond grinding wheels are likely to remain in short supply and that grinders of tungsten carbide should convert from diamond wheels to silicon carbide wheels.

The diamond grinding wheel manufacturers disputed a claim, made at an October 1952 conference which silicon carbide wheel makers held with NPA, that 90 percent of all tungsten carbide grinding can be done with silicon wheels.

They admitted that silicon carbide wheels have their place for certain applications, but challenged an assumption that they are more economical or more effective than diamond wheels. They said silicon wheels can't be used for internal, form, thread or chip-breaker grinding. Such ginding is possible only with diamond wheels, they pointed out.

Users of diamond grinding wheels should not be "panicky" about the availability of such wheels, the manufacturers said.

Members of the diamond grinding wheel manufacturing industry, which grew from a usage of 50,000 carats of diamond bort and powder in 1927 to nine million carats in 1952, praised the effectiveness of Order M-103 in conserving diamond bort.

PROMPT SHIPMENT
of your Complete Order!

Rely on DIECO to fill your order **in full** with **one complete shipment.** All types, sizes in stock. Those pictured, plus Hollow Pipe Plugs, Allenuts, Square Head Set Screws, Flex loc Nuts, Lockwashers, Hex Wrenches & Key Sets, etc. Order now for quick shipment.

The DIE SUPPLY Co.

DIECO

CLEVELAND 9: 1400 Brookpark Rd. ★ SHadyside 1-9000 ★ TWX-CV-202 ★ LI-122
PITTSBURGH 6: 122 S. Sheridan Ave. ★ EMerson 1-0440
DAYTON 4: The Die Supply Sales Co., 311 Vermont Ave. ★ MI. 9691 ★ TWX-DY-85
BUFFALO 1: Die Supply Corporation, 234 Carolina St. ★ MAdison 1964

PUBLICATION

Keep Informed! CATALOGS • BULLETINS • SPECIFICATIONS

Heavy Duty Lathes by Simmons Machine Tool Corp., North Broadway, Albany 1, N. Y., are described in new bulletin 92952. This line has been redesigned for more power and rigidity and is particularly suited for all plants where heavy work in turning, facing and threading to close tolerance is routine.
Circle Inform-A-Gram No. B1.

Fastener Selection described in new bulletin from Grip Nut Co., 332-6 S. Michigan Ave., Chicago 4, features new Gripco "Clinch" nut for blind assemblies or for furnishing additional threading depth for application of bolts to thin metals. Also full line of regular nuts, steel or brass.
Circle Inform-A-Gram No. B2.

FLEXIBLE SHAFT TOOLS

SEND FOR BULLETINS!

Complete bulletins and operating data are quickly available. Send today, stating your particular production problem. Use the Coupon.

Whether you're finishing a casting, a weld, a fine die or stainless steel surface, you'll get the equipment that will do the job best from the best-known name in flexible shaft equipment—Haskins. Here is a company with a world of finishing experience to offer you—and a line of flexible shaft equipment in which long-life, multiple usefulness and economy have never been sacrificed to price.

R. G. HASKINS COMPANY 2647 W. Harrison St., Chicago, Ill.

Send data on Haskins equipment for _____ (state operation)

Name _____

Firm Name _____

Street address _____ City _____ State _____

32 Pages of Gage Information. A new hardbound brochure from Webber Gage Co., 12900 Triskett Rd., Cleveland 11, Ohio, has exhaustive listing of gage blocks and fixtures, includes comprehensive eng'g data and sections on a company inspection service and on proper care of blocks. Write direct.

Industrial Applications of Disc-Type Brakes are featured in new booklet from Industrial Brake Dept., Aviation Products Div., Goodyear Tire and Rubber Co., Inc., Akron 16, Ohio. Fully illustrated, complete operational data.
Circle Inform-A-Gram No. B3.

Die Making Machinery designed for speed in lapping, sawing, and filing operations is described in current literature from the Oliver Instrument Co., 1436 E. Maumee, Adrian, Mich. Full data is given.
Circle Inform-A-Gram No. B4.

A Heavy Duty Anti-Weld Soluble Oil is now being produced by the Motch & Merryweather Machinery Co., Cleveland, for machine tool use. It deters welding and pick-up, prevents rust. Smokeless and odorless.
Circle Inform-A-Gram No. B5.

For Marking Delicate or Smooth-Finish Parts the Matthews No. 90 "Airgrit" machine is recommended. New bulletin "Operation Delicate" from Jas. H. Matthews & Co., 3942 Forbes St., Pitts 13, Pa., has all data. Excellent and speedy results with unskilled labor.
Circle Inform-A-Gram No. B6.

New Principle Saves $100 per Carbide Grinding Hour! Literature from the Dynatomic Corp., 7 South Dearborn St., Chicago 3, Ill., has all data, complete with comparitive performance figures. Diamond wheels are eliminated, finishes in the order of 5 microinches rms obtained, and grinding speed is increased between 10 and 20 times. You should see this.
Circle Inform-A-Gram No. B7.

High Speed Automatic Dieing Machines. Complete specifications on a line of machines including all the latest features essential for the high speed production of stampings by the progressive die method in a capacity range from 25 to 400 tons are given in 60 page brochure from Henry & Wright Mfg. Co., Div. Emhart Mfg. Co., Hartford, Conn. Address your inquiry direct, mentioning this magazine.

PREVIEWS

For your request circle Inform-A-Gram Key Number on postage free card.

"The Toolmaker Line" is title of this new booklet from Montgomery & Co., Inc., 53 Park Place, New York City 7, U.S.A. Has catalog information on more than 40 tools and attachments, through live centers and machine vises to milling machine attachments and drilling tables.
Circle Inform-A-Gram No. B8.

Glenny Adjustable Push Broaches are described in the latest catalog from Kase Machine Co., 18430 Nottingham Rd., Cleveland 19, Ohio. Without expensive time consuming set-up this equipment will cut keyways accurate to plus or minus .0005" on your arbor press. Full data for complete size range.
Circle Inform-A-Gram No. E9.

Conveyorized Pressure Testing Machine checks automotive engine cylinder head jacket areas for leaks, is described in bulletin 103-36 from Modern Industrial Eng'g Co., 14230 Birwood, Detroit 4, Michigan. Photos, complete operating description and specifications.
Circle Inform-A-Gram No. B10.

Cardinal Speed Vise is detailed in new catalog from the Cardinal Machine Co., Glendale, Calif. Designed specially for accommodation of a wide variety of jig shapes.
Circle Inform-A-Gram No. B11.

A Complete Cutter Catalog in a range large enough to allow accurate tool selection for any job is now to be had from Brown & Sharpe Mfg. Co., Providence 1, R.I.
Circle Inform-A-Gram No. B12.

Ovee Screw Thread Comparator instantly tells exact size of screw thread, actual discrepency of rejects, how much to allow for plating, and how to avoid rejects. Detailed literature from O-Vee Spring Gauge Co., 2516 W. Vernon Ave., Los Angeles 8, Calif.
Circle Inform-A-Gram No. B13.

New Prosser Carbide Grinder. Model AA, from Thomas Prosser & Son, 120 Wall Street, New York 5, N. Y., has improved features including full ½ hp motor and heavier shaft, giving greater reserve power, ruggedness, and freedom from vibration. Regular features include quick action indexing tables with rigid lock; compensation for wheel wear; and provision for use with diamond, silicon carbide, or aluminum oxide wheels. Models and sizes for wet or dry grinding, full range of attachments.
Circle Inform-A-Gram No. B14.

End Plate with easy-to-reach adjusting screw aligns precision taper roller bearings in improved live center. Inserts may be changed without removing the center from the machine, and adjustment for wear made with extreme accuracy in less than one minute. Arrow Tool & Reamer Co., 418-422 Livernois Ave., Detroit 9, Mich.
Circle Inform-A-Gram No. B15.

Last Word Wheel Dresser is designed for magnetic chuck mounting, will accurately dress any concave or convex radius with angles tangent to radius. Can also be used for plain radius or angle dressing or any combination. Setup of diamond is rapid, simple, and positive. Last Word Sales Co., 18500 Mt. Elliot Ave., Detroit 34, Mich.
Circle Inform-A-Gram No. B16.

To Protect Their Ships From Unseen Dangers . . .

Mariners Use Marking Devices

Guiding his ship through shoal, narrow or treacherous waters, the Mariner depends on channel buoys, lighthouses, flashing lights, and other marking devices—all directing him to his safe course through navigable water.

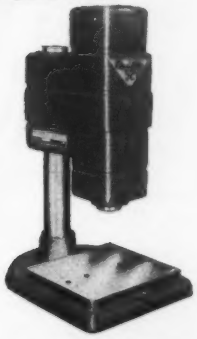
CADILLAC 52

Air Impact Press

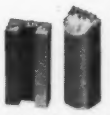
For

High Speed Marking—

Assembling, Branding, Staking, Crimping, Riveting and also for producing Light Stampings



This new Cadillac "52" is faster, has more power, more pressure. It delivers in speeds up to 10,000 strokes per hour — pressure can be obtained up to 8 tons, and is adjustable from light to heavy marking. The pressure can also be regulated to give proper ram action for branding or color leaf marking. Special jigs or fixtures are not required for average work. The Cadillac "52" has automatic controls which "think" for the operator — give high production. Can be supplied as: Hand actuated, foot actuated, electrically actuated. It is light in weight, can be easily moved.



DIE INSERTS

ROLL SEGMENT DIES

FORGING HAND STAMPS

Many marking problems can be solved by Cadillac Marking Devices such as these . . . all made of special alloy tool steel, giving long life and unexcelled performance.

For full information write for Bulletin A-52

For full information write for Bulletin SE-130

CADILLAC STAMP CO.

FACTORY and OFFICES

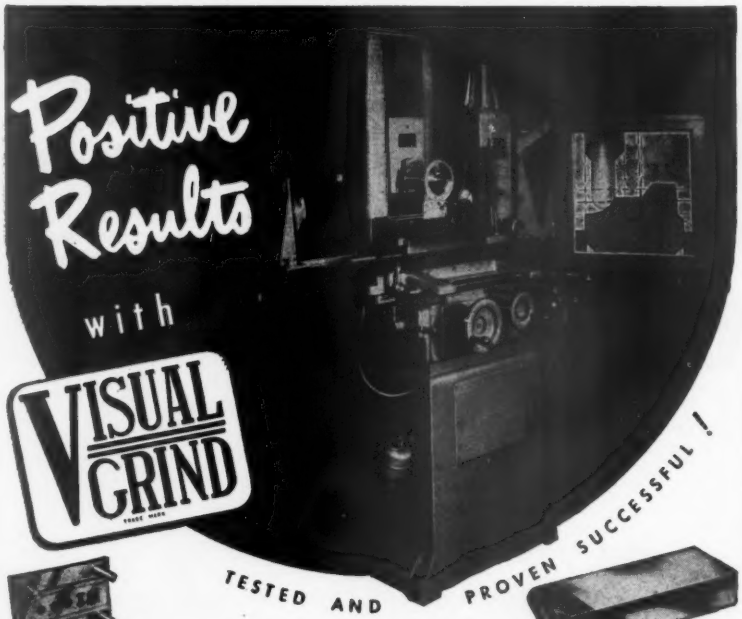
17303 RYAN ROAD • DETROIT 12, MICH.

Suggested Ways To Improve Products, reduce production cost and increase customer satisfaction by using stainless steel wire thread inserts in tapped holes fill a new 8 page booklet by Heli-Coil Corp., 1303 Shelter Rock Lane, Danbury, Conn.
Circle Inform-A-Gram No. B17.

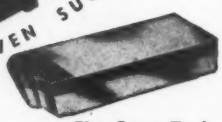
The Mathewson Adjustable Drill Jig eliminates layout, cuts drilling time. A new catalog sheet from the Mathewson Machine Works, Inc., 2 Hancock St., Quincy 71, Mass., gives complete shipping and engineering data.
Circle Inform-A-Gram No. B18.

"dag' Colloidal Graphite as a High-Temperature Lubricant" is title of new case-history style bulletin from Acheson Colloids Co., Div. Acheson Industries, Inc., Port Huron, Michigan. Effective lubrication to 2000° F.
Circle Inform-A-Gram No. B19.

Full Data on the Speed-Vise, a new drill press vise which is designed for maximum ease and speed of locking and adjustment, and which can radically cut jig and fixture cost, is now available from Montgomery & Co., 53 Park Place, New York 7, N. Y.
Circle Inform-A-Gram No. B20.

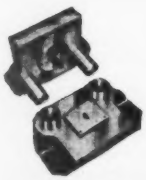


Progressive Die


Flat Form Tool

Here is precision contour grinding at its best. Steel and tungsten carbide form tools, die sections, templates and related items are efficiently processed in dependable, economical fashion. Our basic magnetic chuck work-holder affords positive positioning yet with flexibility for cam, circular and index grinding with the proper fixtures. Work-piece quality is controlled visually at all stages, either while using pre-dressed grinding wheels or when generating the required contour by means of successive, controlled movements. Durable construction around precision optics insures rigidity and long life.

Circular Form Tool


Blanking Die

Dovetail Tool

Ask for Bulletin T-3

VISUAL GRIND THE CLEVELAND GRINDING MACHINE COMPANY
1643 EDDY ROAD • CLEVELAND 12, OHIO
New Possibilities in Optical Grinding

Hydraulic Cylinder Bulletin H-104G from the Miller Motor Co., 2040 N. Hawthorne Ave., Melrose Park, Ill., supercedes previous issues, gives complete and compact engineering, design, construction, mounting and dimension data covering the line of space-saving square-design hydraulic cylinders for 2000-3000 psi operation. 13 different mounting styles in 1½" through 12" bores.
Circle Inform-A-Gram No. B21.

New Buffing and Polishing Composition adheres strongly to the wheel face to form a heavy, fast drying head which does not fly off and remains firm even in the warmest weather, gives excellent results in cutting, polishing, deburring, or satin finishing all metals. From Hanson-Van Winkle-Munning Company.
Circle Inform-A-Gram No. B22.

Onsrud Portable Air Turbine Grinders come in three models for spindle speeds between 38,000 and 75,000 rpm. Higher speeds permit the use of small diameter carbide wheels and points. Light-weight balanced spindles give vibration-free performance and easy handling. Onsrud Machine Works, Inc., 3941 Palmer St., Chicago 47, Ill.
Circle Inform-A-Gram No. B23.

Cutting Inspection Costs by optical gaging is topic of new booklet by Eastman Kodak Co., Industrial Optical Div., 343 State St., Rochester 4, N. Y. Illustrates uses of special fixtures and charts to inspect to close tolerances large parts, complex shapes, and blind holes and recesses using contour projection.
Circle Inform-A-Gram No. B24.

60 To 75% Savings in Diamond Grinding Costs are possible with the new dual purpose Vap-Air Exhaust machine, which first supplies accurately controlled coolant to wheel center to assure even coolant distribution, and simultaneously sucks used coolant and sludge into a tank for collection and reclamation of the diamond. Full data from Shelboerg Mfg. Co., 29 Ridgeview Drive, Indianapolis, Indiana.
Circle Inform-A-Gram No. B25.

48 Pages of Standard Cutting Tool Information. New catalog 101 from Illinois Tool Works, 2501 N. Keeler Ave., Chicago 39, Ill., lists an unusually wide selection, including end mills, saws, milling cutters, tool bits, and shaper cutters. Also complete catalog information on the companies' die filing machines.
Circle Inform-A-Gram No. B26.

General Purpose Grinding Wheels by Carborundum combine versatility with quality performance on a wide range of materials. They are furnished in standard sizes.
Circle Inform-A-Gram No. B27.

Boring Mills and Radial Drilling Machines are subject of new catalog 1152 from Cincinnati Gilbert Machine Tool Co., 3366 Beekman St., Cincinnati 23, Ohio. Radials, table and floor type boring mills. All data and specifications.
Circle Inform-A-Gram No. B28.

New Series of 20 to 1 Speed-Reduction Units features improvements in gears, bearings, housings, lubrication and oil sealing systems. Most advanced design available in shaft-mounted speed-reducers. Full eng'g data from American Pulley Co., 4200 Wissahickon Ave., Phila. 29, Pennsylvania.
Circle Inform-A-Gram No. B29.

Bulletin Lists Actual Savings achieved by retipping worn centers with Colmonoy #6 wear-resistant alloy lathe center tips, illustrates methods of application which make use of silver soldering techniques. From Diamonds and Tools, Inc., 19345 John R Street, Detroit 3.
Circle Inform-A-Gram No. B30.

Honing of all Parts from ½″ to 2½″ OD can be done on any drill press, lathe, or electric drill using a single tool. Write for literature on the "Odee-Hone" to the Micromatic Hone Corp., 8100 Schoolcraft, Detroit 4, Michigan.
Circle Inform-A-Gram No. B31.

Motorized Spindles of all kinds are featured in a catalog now available from The Standard Electrical Tool Co., Mt. Hope and Sixth Sts., Cincinnati 4, Ohio. More than seven different styles are produced for second operation work on planer, lathe, boring mill, etc.
Circle Inform-A-Gram No. B32.

Data Sheet on Punches and Button Dies is now available from the Ring Punch & Die Co. Punches in carbon vanadium and high carbon, high chrome steels, in variety of stock sizes from 1/32″ to 1″ diameter in increments of 1/64″.
Circle Inform-A-Gram No. B33.

Mora Universal Precision Height Gauge by Brand Tool & Supply Co., 907 S. Victory Blvd., Burbank, Cal., is featured in new catalog. The gauge is equipped with movable differential scale system, may be used with dial indicator and as dial platform gauge. Full data, prices, etc.
Circle Inform-A-Gram No. B34.

High Speed Horn Press #55 Model G by Perkins Machine Co., Warren, Mass., is heavy-duty, versatile, and features an adjustable bed. Specifications include 45 ton capacity; 22½″ by 26″ bed; stroke as ordered to a maximum of 7″ (standard 3″). Distance between gibs 11½″, center to back 12½″.
Circle Inform-A-Gram No. B35.

Low First Cost and Low Operating Cost are combined in the new No. DG-1 portable electric vapor degreaser from J. D. Wallace & Co., 134 S. California Ave., Chicago 12, Ill. Self-contained unit; full data.
Circle Inform-A-Gram No. B36.

Two Technical Articles, one on crush grinding techniques for intricate shaped broaches and the other on a transfer machine line with automatic gaging and assembly equipment are featured in new issue of Colonial Broaching News from Colonial Broach Co., P.O. Box 37, Harper Station, Detroit 13.
Circle Inform-A-Gram No. B37.

Handy Kit Contains File Assortment for Die Work. All 12 files in this plastic basic kit are "00" cut with ⅜″ shanks and 4″ length of cut. Designed for power filing machine use, extra heavy and produced from forged rounds for absolute alignment of body and shank. Illinois Tool Wks., Chicago, Ill.
Circle Inform-A-Gram No. B38.

Design Aid is included in latest rotary jig and pilot bushing catalog from Gatco Rotary Bushing Co., together with diagrams of turret lathe and drill press applications.
Circle Inform-A-Gram No. B39.

JIG and FIXTURE
COMPONENT PARTS
Eliminate the designing and making of clamps and other fixture parts. LODDING makes them for you.
LARGE FACTORY AND DISTRIBUTOR STOCKS ASSURE QUICK DELIVERIES.
LODDING
Write for CATALOG
showing 365 items that can save you time and money.
LODDING, Inc.
WORCESTER, MASS.

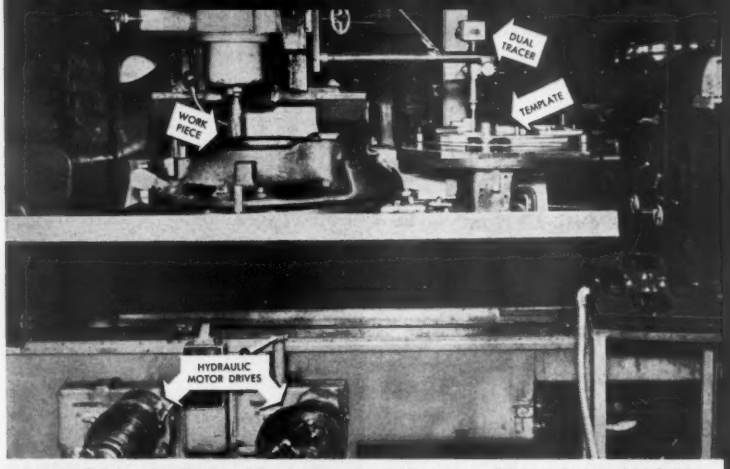
The Famco 18 Ton Power Press has solenoid operated, nine point jaw clutch for versatility, ease of operation, and added safety. Catalog is now available from the Famco Machine Company.
Circle Inform-A-Gram No. B40.

New Sub-Zero Freezers for Testing. New unit will hold any temperature from -10°to -70°F and has a thermal capacity of 500 B.T.U., per hour. Chilling chamber sizes from 5 down to 1.5 cubic feet. Full data on this new XV-70 series from Sub-Zero Products Co., Cincinnati 29, O.
Circle Inform-A-Gram No. B41.

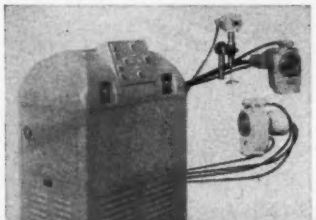
10 Cutting Teeth Give Greater Speed, lower labor costs, greater accuracy and uniformity in duplicate pieces without gaging, makes possible utilization of unskilled labor in threading. New bulletin 110D from Rivett Lathe & Grinder, Inc., Brighton 35, Boston, Mass., has all data.
Circle Inform-A-Gram No. B42.

Lassy Model 12F Hand Tapper, universal tap and die guide, and work holder are all described in current literature from the Lassy Tool Company. Complete ordering and engineering data given.
Circle Inform-A-Gram No. B43.

DUPLICATE MACHINED PROFILES and CONTOURS ON A PRODUCTION BASIS

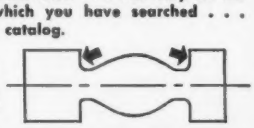


PERFORM INTERNAL AND EXTERNAL CONTOUR WORK ON LATHE OR MILL... *at low cost!*



Original accuracy, normal cutting speeds, simple operation. (1) Controls two feeds simultaneously. (2) Does not interfere with conventional use of machine. (3) Applicable to most standard machine tools . . . This may be the answer for which you have searched . . . Write for our catalog.

90° shoulder and contour on lathe work



TRACER CONTROL CO.
Distributors for Lodge & Shipley Duplicator
595 E. 10 Mile Road • P. O. Box Q • Hazel Park, Mich.

Independent Selection of Speed, Feed, and indexing, plus new draw bar collet for faster loading and unloading are features of No. 1 Gear Hobber by Hamilton Tool Co. New adjustable spindle nose ensures trueness of workpiece to .0001" and simplifies set-up changeover. Bulletin No. H-492.
Circle Inform-A-Gram No. B44.

Standard Shaping and Automatic Duplicating are possible with the hydraulic follower-equipped Cincinnati Shaper. New Developments are the Electro-magnetic clutch and brake for ease of control and faster operation. Bulletin DN-1 and catalog N-5 describe the machine and attachments. Cincinnati Shaper Co.
Circle Inform-A-Gram No. B45.

Well Illustrated Booklet is devoted to a series of case histories showing how critical material shortages have been solved by the use of Meehanite castings. Also tabulations showing specific replacements of alloyed irons and steels, brass, bronze, etc. Meehanite Metal Corp., 714 North Ave., New Rochelle, N. Y.
Circle Inform-A-Gram No. B46.

Swedish "Sajo" Horizontal Milling Machines are now being distributed in the United States by Austin Industrial Corp. Available either as plain or universal models, these machines are of the medium duty, high speed type, having functional design for quality performance with minimum original outlay.
Circle Inform-A-Gram No. B47.

Inside Cutting, Beading and Flanging of sheet metal parts to 10 gauge mild steel and 11 gauge stainless described in new catalog TS from Wales-Strippit Corp., 345 Payne Ave., North Tonawanda, N. Y. No starting hole required, material may be started while ram is operating.
Circle Inform-A-Gram No. B48.

Automatic Rack Type Plating Equipment where design eliminates high superstructure and enables low cost volume processing to be accomplished in a minimum of floor space is described in new bulletin #61 from Frederick B. Stevens, Inc., Detroit 16, Michigan.
Circle Inform-A-Gram No. B49.

Model "A" "RFC" Roll Feed is designed for 4, 6, and 8 ton presses. It cannot slip, and instant reverse is possible. Literature covering the complete "RFC" line is available from the Roll-Feeds Corp.
Circle Inform-A-Gram No. B50.

Latest Catalog from Detroit Die Set Corp. has 48 pages, includes a wealth of useful illustrated information. Complete price list given.
Circle Inform-A-Gram No. B51.

Hardness Conversion Wall Chart from Clark Instrument, Inc., 10208 Ford Rd., Dearborn, Mich., may now be had free of charge by readers through the Inform-A-Gram card. It's printed on heavy stock, and has all necessary data in easy-to-read tabular form. Get your copy.
Circle Inform-A-Gram No. B52.

"Speed Treet" Electric Furnace is designed for high speed steel application where temperatures to 2600° F are required, gas tight construction permitting the use of controlled atmosphere. Full data in bulletin IND-1147-EE from Hevi Duty E ectric Co., Milwaukee 1, Wis., plus details of a combination of units designed to complete toolroom needs.
Circle Inform-A-Gram No. B53.

New Dry Lubricant For Metal Forming anounced by Gilron Products Co., 6007 Euclid Ave., Cleveland 3, Ohio. Eliminates oil films and smut in subsequent operations, has no fumes or odors and is noninflammable. Literature available.
Circle Inform-A-Gram No. B54.

Complete Specifications on the Cincinnati "Filmatic" No. 2 centerless grinding machine may be obtained by writing for catalog No. G-591. If you haven't considered automatic centerless grinding for your precision parts, bring yourself up to date by writing for your copy.
Circle Inform-A-Gram No. B55.

Spraywelded Hardfacing Alloys fusion-bonded to metal parts provide non-porous, wear, heat, erosion and corrosion resistant surfaces, having Rockwell C hardnesses ranging from 35 to 61. Full data in new bulletin from Wall-Colmonoy Corp., 19345 John R Street, Detroit 3.
Circle Inform-A-Gram No. B56.

Arbor Spacers and Shims for milling, slitting, and gang saw set-ups are described in current catalog from De-Sta-Co. Sets in 20 diameters ⅜" to 4", 19 graduated thicknesses .001" to .125". Specials over .125".
Circle Inform-A-Gram No. B57.

Compression Spring Assortments, trigger stops for progressive dies, gauge handles and stops, magnetic parallels and V blocks, and many fixture components are described and priced in current comprehensive catalog of the Reid Tool Supply Co., 709 Baker St., Muskegon Heights, Mich.
Circle Inform-A-Gram No. B58.

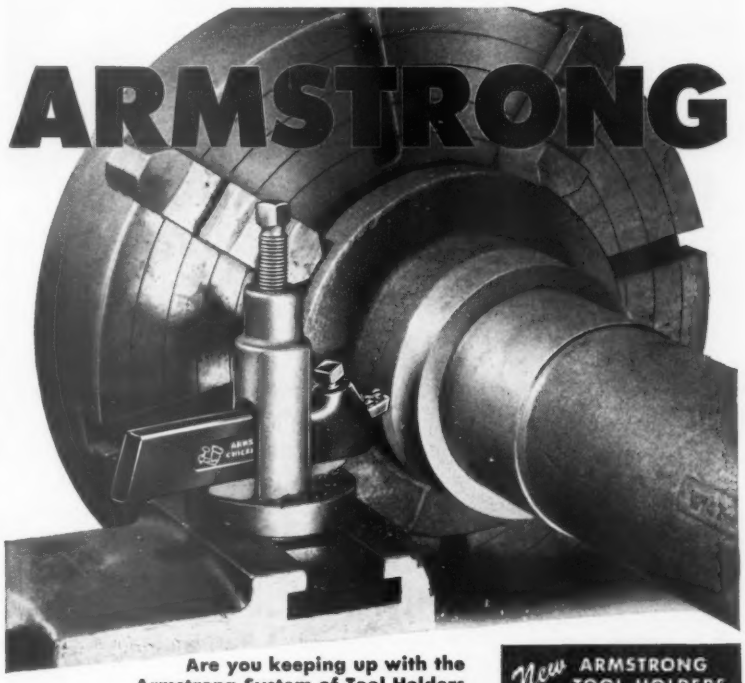
Hoggson Brand Hand-Cut Steel Stamps, featuring chamfered corners for ease of location, and made in straight and reverse types, are subject of comprehensive catalog now available from Hoggson & Pettis Mfg. Co., 141D Brewery St., New Haven 7, Conn.
Circle Inform-A-Gram No. B59.

New Precision Surface Form Grinder Bulletin available from E-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Michigan. Style 84 features completely illustrated and described, with complete specifications and a floor plan.
Circle Inform-A-Gram No. B60.

New Water-Type Coolant Contains Wax, has exceptional lubricating qualities and minimizes heat at its source, extending tool life and providing a better finish on metals. Full eng'g data from Industrial Products Dept., S.C. Johnson & Son, Inc., Racine, Wisconsin.
Circle Inform-A-Gram No. B61.

Standard and Expansion Copper Head Laps may be used over and over again, changing only the sleeves for different jobs. They are available from stock in standard sizes from ⅛" through 2½" diameters from the Boyar-Schultz Corporation. A descriptive circular is also ready for distribution.
Circle Inform-A-Gram No. B62.

The Froom Load Centering Eye Bolt allows the safe lifting of heavy dies, tools, machinery, etc. Descriptive literature has been issued by the manufacturer.
Circle Inform-A-Gram No. B63.



Are you keeping up with the Armstrong System of Tool Holders

Doubtless you are daily using ARMSTRONG TOOL HOLDERS that have been in continuous operation for many years. This is sound practice, for this means added profits without added tool costs. But to become complacent, so satisfied that you forget your ARMSTRONG TOOL HOLDERS, is unwise. The "Armstrong System" is a growing thing, with new types and sizes of ARMSTRONG TOOL HOLDERS constantly being developed to more effectively meet new machining conditions, or to take advantage of newly developed cutting materials.

With modern ARMSTRONG TOOL HOLDERS for each operation, you can greatly increase speeds and feeds. You can lower machining cost and further increase profits.

If you haven't kept up with the "Armstrong System" write for an ARMSTRONG Catalog and check to see that you are using the most efficient ARMSTRONG TOOL HOLDER for each operation on all lathes, planers, slotters and shapers.

WRITE FOR CATALOG

New ARMSTRONG TOOL HOLDERS
ARMSTRONG Spring Form Threadin Tool Holder
ARMSTRONG Spring Cutting-off Tools
ARMSTRONG Carbide Tool Holders for Carbide-Tipped Cutters
ARMSTRONG C.A. Tool Holders for ARMALOY Cast-Alloy Cutter-Bits

ARMSTRONG BROS. TOOL CO. *The Tool Holder People* 5228 W. ARMSTRONG AVENUE CHICAGO 30, ILL.

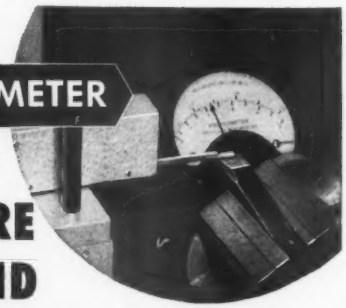
Precision Grinding of die clearances and sharpening of cutter dies and punches is readily accomplished with Milwaukee profile grinder. Diamond wheel dresser is built in. Current catalog from Rice Pump & Machine Co., Grafton, Wis.
Circle Inform-A-Gram No. B64.

Milling, Grinding and Polishing Machines designed for jet blade applications are described in bulletin 50620 from Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Michigan. Machines are pictorially illustrated with their separate features, complete information, specifications.
Circle Inform-A-Gram No. B65.

Maintenance Inspection of Hydraulic Press Components by ultrasonic reflectoscope is described in a data sheet from Sperry Products Inc., Danbury, Connecticut. No shutdown, complete portability, complete accuracy featured.
Circle Inform-A-Gram No. B66.

"Mirra-Lap" Diamond Compound is the subject of an attractive catalog from J. K. Smit & Sons, Inc., Murray Hill, N. J. Use recommendations and interesting applications of the product are contained in the catalog, together with prices and packagings of the different grades.
Circle Inform-A-Gram No. B67.

By using the PROFILOMETER



you can get

90% to 800% MORE PIECES PER GRIND

from cutting tools of all types!

WELL-KNOWN COMPANIES report *tool life increased 90% to 800% and more*—simply by smooth-finishing the tool faces after sharpening. This same smooth-finishing also enables the tools to produce a *more consistent finish* on the work.

These benefits usually require grinding or lapping the tool faces to a finish of 1 to 5 microinches. A difference of a few microinches makes a big difference in performance. Therefore, to make SURE, many companies *specify* microinch roughness of tool surfaces, and *measure* it with the Profilometer. The savings obtained far outweigh the little time required to make such measurements.

FREE BULLETIN L22 tells

- How consistent surface finish saves time, tools, material.
- Why cutting tools often produce a non-consistent finish.
- How to obtain more consistent finish and more pieces per grind.
- Typical benefits obtained by well-known companies.
- Why most plants use the *Profilometer* for measuring microinch roughness.

May we send you a copy? You'll be interested!

Profilometer is a registered trade name.

MMCo MICROMETRICAL MANUFACTURING COMPANY

345 S. MAIN ST. ANN ARBOR 15, MICHIGAN

Precision, Economy, and Multi-Spindle Drill Presses are featured in catalog 5206, new from South Bend Lathe, South Bend 22, Indiana. Fully illustrated, also contains data on many production boosting attachments.
Circle Inform-A-Gram No. B68.

Buck 6 Jaw 6" Chuck boasts precision to .0005". One pinion moves jaws, while chuck is equally adaptable to lathes, screw machines, dividing heads, grinders, etc. Current catalog from Buck Tool Co., 618 Schippers Lane, Kalamazoo, Mich., details this and remainder of line.
Circle Inform-A-Gram No. B69.

Wire Punches. Folder gives data on HSS punches for close tolerance small dia. holes closely spaced; 70 standard sizes between .032" and .189" available from stock. Others quoted special. Dayton Punch & Insert Co., 921-27 Valley St., Dayton 4, Ohio.
Circle Inform-A-Gram No. B70.

Four Page Quick-Reference Bulletin on motors, regulators, and generators—bulletin A-2703—from Reliance Electric & Engineering Co., 1088 Ivanhoe Rd., Cleveland 10, Ohio, is designed to aid quick appraisal. Adjustable speed drive for AC circuits and electronic controls and regulators is featured. Interesting application data is included.
Circle Inform-A-Gram No. B71.

The Reich 3-Way Surface Test Indicator can be read by viewing from either side or at the end, has scale graduated in thousandths with a non-magnetic movement range of .014". Feeler may be set at any position from 90° of its vertical position. J. R. Reich Mfg. Co., 45 E. Stroop Rd., Dayton 9, Ohio.
Circle Inform-A-Gram No. B72.

Bulletin CM from Severance Tool Industries, Inc., has complete data, prices, and ordering information on the line of "Carbo-Mills," which come in a complete range for any purpose. These mills are ground from solid carbide, offer repeated regrind possibilities without efficiency loss.
Circle Inform-A-Gram No. B73.

You Can Print Round, Rectangular, Or Hex Bar or Tube as fast as you can feed it with a printer described in a new bulletin from Jas. H. Matthews & Co., 3942 Forbes St., Pitts 13, Pa. Easy adjustment from ½" to 6". Full descriptive data.
Circle Inform-A-Gram No. B74.

New Dumore Grinder Eliminates hand sharpening of small drills, has speed, versatility, and complete accuracy. Literature from the Dumore Company has full data.
Circle Inform-A-Gram No. B75.

Johnson Metal Cut-Off Band Saws are efficient and low-cost, have ample capacity and ruggedness. Literature describing the complete line is available from the Johnson Mfg. Corp., Albion, Mich. Machines are available wet or dry cutting.
Circle Inform-A-Gram No. B76.

Exhaustive Line of Centrifugal and Positive Displacement Pumps is illustrated and described in new catalog 160-26 from Pioneer Pump & Mfg. Co., 19657 John R Street, Detroit 3, Michigan. Lubricating oils, coolants, cutting oils, etc. Installation diagrams included.
Circle Inform-A-Gram No. B77.

Huot Drill Dispenser is described in circular now available from Huot Mfg. Co., St. Paul 5, Minn. Entire drill stock seen at a glance.
Circle Inform-A-Gram No. B78.

New Automatic Press Equipment Assures automatic unformity of mechanical accuracy and grinding characteristics of the comprehensive line of internal grinding wheels in bulletin ESA-29 from Simonds Abrasive Co., Tacony and Fraley Streets, Philadelphia 37, Pa. Grain and grade job recommendations.
Circle Inform-A-Gram No. B79.

Dumore Tool Post Grinder mounts on planer, lathe, shaper, mill, etc., with equal facility. Internal grinding accurate to .0001" can be performed, transfer and floor time saved, Catalog from Dumore Corp., Racine, Wisconsin.
Circle Inform-A-Gram No. B80.

Solution to Scale Removal Problem on a quench sizing operation is instanced in a 4 page case history bulletin from the Honan-Crane Corp., 208 Indianapolis Ave., Lebanon, Ind. Manual cleaning was reduced 80%, annual savings $2,000.
Circle Inform-A-Gram No. B81.

Compound Microscope Base has 6" lateral and 4" traverse continuous micrometer motion. This instrument does double duty as accurate machining table and as complete toolmakers microscope. Brochure from Erb & Gray gives full data and suggested optical units.
Circle Inform-A-Gram No. B82.

Descaling Hot-Rolled Steel Strip at high speeds and low costs by means of airless blasting is the subject of bulletin 894, published by American Wheelabrator & Equipment Corp., 1183 S. Byrkit St., Mishawaka, Indiana.
Circle Inform-A-Gram No. B83.

Free Samples of Industrial Padded Shipping Bags now available from Jiffy Mfg. Co., 360 Florence Ave., Hillside, N. J. Afford complete protection from dirt, dust, moisture.
Circle Inform-A-Gram No. B84.

Hydraulic Presses by Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill., are featured in new bulletin 216. Contains a complete line of standards and some interesting special types.
Circle Inform-A-Gram No. B85.

Scully-Jones Automatic Recessing Tools will groove, face, and chamfer, etc., on standard drill presses, radial drills, and chucking machines as well as on special machines. Tools are adaptable to single or combination operations, Bulletin No. 10-50 has full types, sizes, specifications, and prices.
Circle Inform-A-Gram No. B86.

New Tool and Die Maker's Accessories Catalog. Producto dowel pins, die springs, stripper bolts and cap screws are conveniently listed in an eight page catalog recently published by the Producto Machine Co., Bridgeport 1, Conn. Also a line of toolroom equipment.
Circle Inform-A-Gram No. B87.

Precision Ground Tool Steel in three grades is described in current literature from the Marshall Steel Co., La Grange, Ill. Complete size range is illustrated and priced; water, air, and oil hardening steels.
Circle Inform-A-Gram No. B88.

A. Harold Frauenthal selects Standard Precision Spindles on his 1800 Series Grinder manufactured by the Frauenthal Division of the Kaydon Engineering Corp., Muskegon, Michigan. Standard Type PAV Vertical Spindle Grinders are the choice of America's leading machine tool builders. Available from ½ to 50 H.P., with speeds of 1200, 1800, 3600 RPM, the PAV is ideal for heavy thrust precision grinding. Available with or without feeds.

Write for catalogue 44 today.

Standardize with
the STANDARD electrical tool co.
MACHINE TOOLS
Mt. Hope & Sisth Sts. ★ Cincinnati 4, Ohio

See us at Booth 660, Western Metal Congress, March 23-27, Los Angeles, Calif.

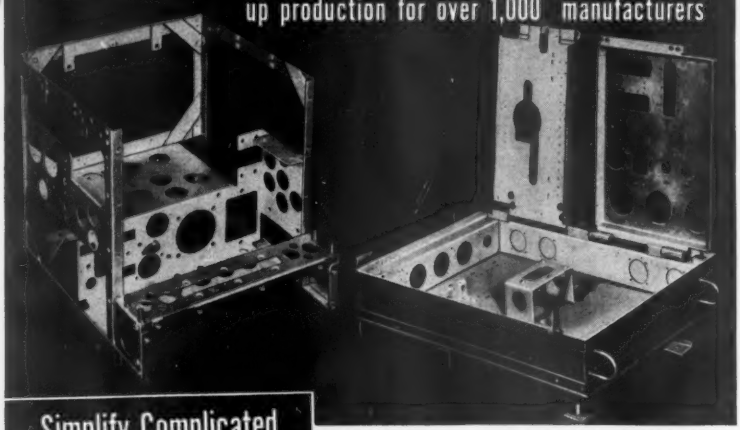
Mastermike Micrometer has accuracy of .00005" throughout its range. Oversize barrel with wide graduations make for ease and accuracy of reading. Details from Karl A. Neise, 381 Fourth Ave., New York 16, N. Y.
Circle Inform-A-Gram No. B89.

Baldor Carbide Tool Grinder has short wheel and bearing centers with dynamic balancing for maximum accuracy, rigidity and smoothness necessary for precision work. Bulletin 341-B from the Baldor Electric Co. on this inexpensive tool.
Circle Inform-A-Gram No. B90.

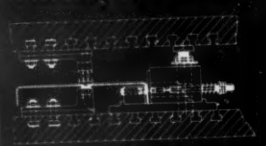
Erickson Full Floating Holder for chuck-held cutting tools allows quick and easy adjustment to offset machine errors. Model 189 permits compensation for both parallel and angular misalignment. Catalog B from Erickson Tools Division.
Circle Inform-A-Gram No. B91.

Centerless Grinding With Continual Visual Inspection is discussed in latest bulletin T-8 from the Cleveland Grinding Machine Company. Many interesting applications are pictured of this young but well-proven process.
Circle Inform-A-Gram No. B92.

Whistler Adjustable and Magnetic Perforating Dies are stepping up production for over 1,000 manufacturers



Simplify Complicated Piercing Operations



Use this HU-50 90° Perforating Unit on the same job with other Whistler Dies... often saves extra press operations.

USE WHISTLER Adjustable and Magnetic Dies for perforating, notching and slotting sheet metals... fast, accurate and cost cutting. Complicated patterns can be set up quickly. Hole arrangements can be changed in the press... without waiting and at no extra die cost. New HU-50 units, that pierce at 90° angle, can be used in conjunction with standard perforating equipment. Fewer press operations are necessary.

Re-use the same dies in different arrangements on many jobs. Punches and dies are interchangeable.

Whistler Adjustable Dies can be used in practically every type press. Standard sizes and shapes of punches and dies available up to 3 inches. Special sizes and shapes to order.

S. B. WHISTLER & SONS, Inc.

748 Military Road
Buffalo 23, New York

For prices and application data on this modern way to speed production and cut unit costs, write for these illustrated Whistler catalogs.

For your convenience **Whistler direct factory representatives are located in most principal cities. Their on-the-job application experience, combined with Whistler's 35 years experience in the manufacture of tools and dies, is available on request.**

Angle-Tangent-to-Radius Forms can be set up in minutes with controlled accuracy with the new "Tangi-Matic" dresser described in literature which you may now get from Perfex Gage & Tool Co., Mt. Clemens, Mich. Complete data.
Circle Inform-A-Gram No. B93.

Burs, Reamers, End Mills, Boring Bits, and tools by the Atrax Co., Francis Ave. & Day St., Newington 11, Con. are made in tungsten-carbide precision ground from the solid. Colorful catalog now available.
Circle Inform-A-Gram No. B94.

Carbide Die Design, Use, and Maintenance is discussed in manual D-124 from the Carboloy Dept. of G. E., Detroit 32, Mich. Tells how long wear and life can improve your production while cutting costs. Application problems fully treated.
Circle Inform-A-Gram No. B95.

Tap Grinding Machines and Attachments, Swiss-Made, are described in literature available from Carl Hirschmann Co., 30 Park Ave., Manhasset, N. Y. This equipment is for converting twist drill grinders to sharpen the start of all usual taps.
Circle Inform-A-Gram No. B96.

Erickson Mandrels grip along their entire length, giving positive grip and self release, each accommodating a wide range of sleeves. Catalog "J" from Erickson Tools Div. details these and other products.
Circle Inform-A-Gram No. B97.

Clamp Support Blocks from the Podlin Tool Co., 3918 Wesley Terrace, Schiller Park, Ill., give stable adjustment from a height of ½" to 10", are instantly adjustable.
Circle Inform-A-Gram No. B98.

Stationary and Portable Toggle Clamps for many different time saving applications are described in the newest catalog from Detroit Stamping Co. Over 40 models holding pressures to 4000 pounds.
Circle Inform-A-Gram No. B99.

Instant Accuracy for any angular set-up, whether single or compound, is provided for by the use of the "Magna-Sine" from the Omer E. Robbins Co., 5722 12th St., Detroit 8. A current catalog is available to T & P readers from the maker.
Circle Inform-A-Gram No. B100.

Federal Plastic Gage Handles are one-third lighter than aluminum, are tough and long lasting, will not chip or mar. Possess good insulating qualities and come in four colors.
Circle Inform-A-Gram No. B101.

"Scleroscope" Hardness Tester is applicable to all types of work. Illustrated literature from the Shore Instrument Mfg. Co., Inc., 9025 Van Wyck Ave., Jamaica 2, N. Y.
Circle Inform-A-Gram No. B102.

Different Types of Aluminum Melting Furnaces, a complete line, are subject of new bulletin #310 from Lindberg Eng'g Co., 2444 W. Hubbard St., Chicago 12, Illinois.
Circle Inform-A-Gram No. B103.

Attachment for 2 and 3 Dimensional Engraving Machines gives precision work at any angle, assures speed and accuracy. Tracer control with rotary table performance. Fryer Tools and Instruments, 188 N. Wells St., Chicago 6.
Circle Inform-A-Gram No. B104.

New Plant and Unusual Production Facilities graphically described in booklet from KSM Products, Inc., Merchantville, N. J. Cold rolled threaded studs and stud welding equipment. Inquiries invited.
Circle Inform-A-Gram No. B105.

Haskins HS-4 Flexible Shaft Equipment is designed to speed pattern, die and mold finishing, and to assure quality production. Complete line is described in literature.
Circle Inform-A-Gram No. B106.

Phoenix Brand Heat Treating Compound is applied as a dry powder, prevents scale, pitting, and decarburization. Big time saver in polishing time after heat-treat. Write Parker Stamp Works, Inc., Hartford, Connecticut.
Circle Inform-A-Gram No. B107.

A Large Range of Work can be performed with Green Engraver, described complete with accessories and application data in a catalog from the Green Instrument Co., Inc., 385 Putnam Ave., Cambridge 39, Mass. Very versatile equipment.
Circle Inform-A-Gram No. B108.

Ideal Electric Etchers are made in various models for different type and size of work. "Universal" model has four etch heats of 100 to 700 watts. Catalog Ideal Industries Inc.
Circle Inform-A-Gram No. B109.

Small Hole Tapping Equipment is fully described in bulletin T-471 from the Hamilton Tool Co. Functional design for precision tapping of small holes at production speeds with good tap life and better than acceptable accuracy.
Circle Inform-A-Gram No. B110.

Complete Line of Industrial Brushes, including maintenance, power-driven, and paint and varnish types, is described in bulletin 205 from the Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, Ohio.
Circle Inform-A-Gram No. B111.

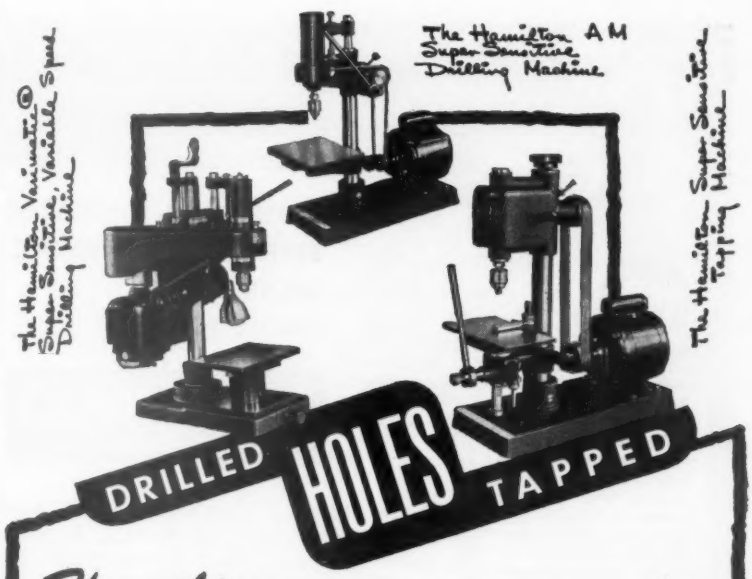
"John's" Drill Jigs save on set-up time, save on tooling costs, and speed work in many machining operations. Heuser Mfg. Co. makes them in 6", 8", and 14" sizes.
Circle Inform-A-Gram No. B112.

Ten pages of Die Spring Information. Write for catalog 1951, complete with illustrations, from the Die Supply Co., 1400 Brookpark Rd., Cleveland 4, Ohio.
Circle Inform-A-Gram No. B113.

Dahlstrom Tap Guide hand taps with machine precision, adapts quickly for lathe use. Furnished complete with 9 tap adapters 8/32" to ¾". Current literature describes, also features tap chucks and auto-stops. Dahlstrom Mfg. Co., 5601 Woodlawn Blvd., Minnesota 17.
Circle Inform-A-Gram No. B114.

Current Gage Catalog from Perfex Gage & Tool Co., gives tabulated prices for size range of reversible thread gages, thread plug and ring gages, and cylindrical plug gages. Fast service on standard and specials is given.
Circle Inform-A-Gram No. B115.

Index Vertical and Horizontal Milling Machines are described in literature currently available from Index Machine Co., 541 N. Mechanic St., Jackson, Mich. High precision and production are combined with low original and maintenance cost.
Circle Inform-A-Gram No. B116.



Hamilton DRILLS AND TAPPERS

MAKE TIME • SAVE COSTS
ON ACCURATE SMALL HOLE PRODUCTION

Small holes . . . *tiny holes* . . . in materials of such diverse characteristics as fiber and monel, ceramic and bronze, are being drilled and threaded speedily, accurately, *profitably* . . . NOW . . . by thousands of Hamilton Drills and Tappers.

The Hamilton VARIMATIC® DRILL,
The Hamilton A-M DRILL,
The Hamilton TAPPER,

each a bench type, super-sensitive machine with ample clearances and travel, incorporate such precision that work is always held well within the tolerance allowed, and such stamina that they maintain their accuracy year after year even under heavy production loads. Our free Bulletin No. V-472 provides full information including specifications. Write now! Tomorrow you may need the information.

THE *Hamilton* TOOL COMPANY
832 SO. NINTH STREET • HAMILTON • OHIO • U • S • A

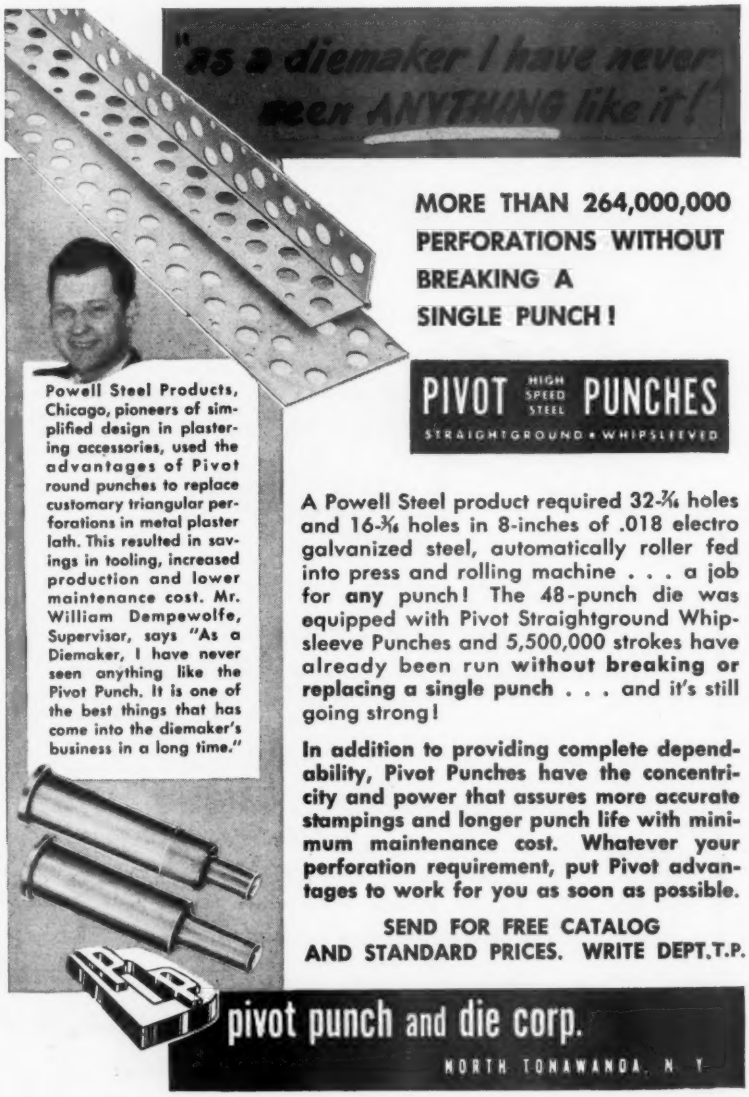
SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

The South Bend 7" Precision Shaper is subject of catalog 5209 from South Bend Lathe, South Bend 22, Indiana. All eng'g data given, plus section on attachments available and specifications table.
Circle Inform-A-Gram No. B117.

Complete Engineering Data and Drawings on the Norgren pilot controlled air pressure regulator are contained in a data sheet now available from C. A. Norgren Co., 3400 So. Elati St., Englewood, Colorado. Will deliver more than 200cfm, boasts continuous and precise control of air pressure from 2-120psi.
Circle Inform-A-Gram No. B118.

Ferguson Roller Gear Drive is a self-locking precision indexing mechanism for punch press dials and high speed intermittent motions on automatic machines. Full engineering data from Ferguson Machine & Tool Co., Inc., 471 Paul Ave., Ferguson Sta., St. Louis 21, Mo. Standards and specials.
Circle Inform-A-Gram No. B119.

Fractional H. P. Motors are featured in a new catalog from Delco Products Div., General Motors Corp., Dayton 1, Ohio. All specifications and eng'g data given. Also data on polyphase types to 100 HP.
Circle Inform-A-Gram No. B120.


"as a diemaker I have never seen ANYTHING like it!"
MORE THAN 264,000,000 PERFORATIONS WITHOUT BREAKING A SINGLE PUNCH!
PIVOT HIGH SPEED STEEL PUNCHES
STRAIGHTGROUND • WHIPSLEEVED
Powell Steel Products, Chicago, pioneers of simplified design in plastering accessories, used the advantages of Pivot round punches to replace customary triangular perforations in metal plaster lath. This resulted in savings in tooling, increased production and lower maintenance cost. Mr. William Dempewolfe, Supervisor, says "As a Diemaker, I have never seen anything like the Pivot Punch. It is one of the best things that has come into the diemaker's business in a long time."
A Powell Steel product required 32-3/16 holes and 16-3/16 holes in 8-inches of .018 electro galvanized steel, automatically roller fed into press and rolling machine . . . a job for any punch! The 48-punch die was equipped with Pivot Straightground Whipsleeve Punches and 5,500,000 strokes have already been run without breaking or replacing a single punch . . . and it's still going strong!
In addition to providing complete dependability, Pivot Punches have the concentricity and power that assures more accurate stampings and longer punch life with minimum maintenance cost. Whatever your perforation requirement, put Pivot advantages to work for you as soon as possible.
SEND FOR FREE CATALOG AND STANDARD PRICES. WRITE DEPT. T.P.
pivot punch and die corp.
NORTH TONAWANDA, N. Y.

Metallizing, both for Production and Maintenance, is subject of a brochure from the Metallizing Co. of America, 3520 W. Carroll, Chicago 24, Ill. Comprehensive data on many money saving applications of the Mogul gun is given.
Circle Inform-A-Gram No. B121.

Permanent Magnetic Separators for tramp iron removal in a wide variety of different applications are described in catalog 15-a from Eriez Mfg. Co., Erie, Pa. Fully illustrated, plus installation data.
Circle Inform-A-Gram No. B122.

Filtration and Handling Equipment, including oil and coolant filters, clarifiers and conveyors, and oil and chip handling equipment are described in a well illustrated booklet from Homan-Crane Corp., Lebanon, Indiana. Engineered to cut costs, increase production and improve efficiency in all types of plant operations.
Circle Inform-A-Gram No. B123.

Work Saving Pipe Tools form subject of a new brochure from the Ridge Tool Co., Elyria, Ohio. Pipe wrenches, threaders, bolt dies, nipple chucks, cutters, reamers, vises, threading machines and portable power drives are but a few of the products given detailed treatment.
Circle Inform-A-Gram No. B124.

Portable Pipe Threading Machines featuring automatically gripping chucks are described in a new bulletin from the Oster Mfg. Co., E. 61st & Carnegie Ave., Cleveland 3, Ohio. Model 582-R will thread pipe after bending at high speed.
Circle Inform-A-Gram No. B125.

Minute Man Keyway Broaches and Sets are featured in current catalog from the du Mont Corp., Greenfield, Mass. Complete size ranges for quick keyway cutting at low cost by hand. Also operating instructions and hints.
Circle Inform-A-Gram No. B126.

"11 Ways To Cut Production Costs" is title of a new brochure from Alemite Div. Stewart-Warner Corp., 1850 Diversey Parkway, Chicago 14. Contains all information on reorganization of lubrication in your plant for maximum economy.
Circle Inform-A-Gram No. B127.

Hydraulic Remote Controls are described in bulletin 20-106 from Sperry Products, Inc., Danbury, Conn. Contains general description and operating principles, general features, and typical applications.
Circle Inform-A-Gram No. B128.

Bulletin FV-53 From Rapids-Standard Co., Inc., has all specifications and data on the floor-veyor heavy duty power belt conveyor. Gives mounting and general feature drawings, full features listing.
Circle Inform-A-Gram No. B129.

New Lubricating Fixture Visually Indicates the amount of grease available to a bearing point. Literature from A. L. Watson Co., 38 Crown St., Milton 87, Mass., has all data and ordering information.
Circle Inform-A-Gram No. B130.

Smooth-Air Clutch-Brake Mechanism and a new system of electropneumatic controls give smooth operation at speeds far in excess of accepted punch press standards to the Federal line. All data on standard, high speed, dial feed and special presses in six to 80 ton capacities is given in a new 20 pager from the Federal Press Co., Elkhart, Ind.
Circle Inform-A-Gram No. B131.

Pulverizer Bulletin from Majac Engineering Co., 189 Freeport Rd., Blawnox, (Pitts. District) Penna, has construction features and all operational data on units for pulverizing a wide range of materials in industrial applications.
Circle Inform-A-Gram No. B132.

1953 Buyer's Guide on Portable Power Tools for industry is now available from the Skil Corp., 5033 Elston Ave., Chicago 30, Ill. Profusely illustrated, catalog data and ordering information on exceedingly comprehensive line.
Circle Inform-A-Gram No. B133.

"How To Improve Factory Methods with Masonite Presdwood" is title of an interesting booklet from Masonite Corp., 111 W. Washington St., Chicago 2. Maintenance, materials handling and materials processing fields fully covered.
Circle Inform-A-Gram No. B134.

You Can Finish Plastic Molds in Minutes. New bulletin 63 from American Wheelabrator & Equipment Corp., 1183 S., Brykit St., gives all data on wet blasting process applied both to manufacture and reconditioning maintenance.
Circle Inform-A-Gram No. B135.

Advantages of Helical Gear Drives are discussed in a new booklet from the Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill. Installation, design and construction features, and all factors governing correct selection are discussed.
Circle Inform-A-Gram No. B136.

Precision Production Crankshaft Grinding is described in catalog N-25 from Landis Tool Co. Waynesboro, Pa. 45 illustrations and sketches show design details, typical applications and operating controls.
Circle Inform-A-Gram No. B137.

Simplified Conversion Tables for determining correct v-belt selection are feature of a new catalog from Thermoid Co., 200 Whitehead Rd., Trenton, N. J. Also construction features for complete range. Industrial applications.
Circle Inform-A-Gram No. B138.

Lubrication Systems for all Industrial Requirements are featured in new catalog #80 from Lincoln Engineering Co., Natural Bridge Ave., St. Louis 20, Mo. Systems feature positive control, preventing waste and contamination.
Circle Inform-A-Gram No. B139.

Tool Steel Gear and Pinion Co., Cincinnati 16, Ohio, has recently issued a catalog featuring special process track, sheave, brake and other hardened wheels for industry. Combine tough and ductile core with surface hardness of 650-740 Brinell, giving unique strength and long life.
Circle Inform-A-Gram No. B140.

Many Different Vibration-Controlling Machine Mountings are described in catalog G-105 from the Korfund Co., Inc., 48-15 32nd Place, Long Island City 1, N. Y. Includes type selector chart, has full data on all fixtures.
Circle Inform-A-Gram No. B141.

"Unisorb" Machine Mountings are described in detail in a new booklet—"Why it pays to anchor your machines with 'Unisorb'." Eliminates the need of lag screws and expansion bolts when securing practically any type of machine, reduces transmitted vibrations as much as 75%.
Circle Inform-A-Gram No. B142.

RELENTLESS PRODUCTION SCHEDULES
and
SMALL PRECISION GEARS

•

FEELING FUTILE?

Unusual conditions are usual now. You are *expected* to build small, precision mechanisms on fast production schedules. And you will be expected to produce them better and faster tomorrow. But why worry? All you will need will be better machines.

MORALE BOOSTER

And better machines are here *now!* The Hamilton No. I Precision Small Gear Hobber will *solve* your problem in respect to gears. All gears, regardless of shape, if they are small and exact, can be produced faster on the Hamilton No. I.

FREE HELP

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PROBLEMS IN PLANT ENGINEERING

What are the plant engineering functions in a medium size industrial plant having some 3300 employees engaged in the manufacture of photographic paper, film, developing chemicals, and cameras? How is the engineering division organized to carry out these responsibilities? What procedure is followed in providing new plant facilities, in developing new equipment, and in performing maintenance and repair work? How are the results checked? These plant engineering problems at the Ansco Division of the General Aniline & Film Corporation are the subject of this discussion.

By J. E. Gahagan

Chief Engineer, Ansco Div'n.
GENERAL ANILINE & FILM CORP.
Binghamton, N. Y.

The photographic industry, excepting for camera manufacture, is classed as a chemical one. It requires much specialized equipment which must be developed and/or designed and built in our plant, because the equipment is not available commercially. Our manufacturing operations are diverse, as are the associated engineering problems.

For example, major portions of our manufacturing operations are of the continuous process type; several operations occur in near total darkness; other operations are carried out under corrosive conditions; others are carried out in explosive vapor areas; and others have high mechanical accuracy problems. Many manufacturing and storage areas require a supply of clean and conditioned air, closely regulated as to temperature, humidity, and cleanliness. Camera manufacture, on the other hand, is a mechanical type of manufacturing operation involving the fabrication of small parts and the assembly of these into a finished product.

The functions which are assigned to Engineering are determined by the nature of the industry, management thinking, and, to some extent, by the engineering department. Typical questions which arise have to do with whether maintenance should report to engineering or to production; and whether the provision of production facilities should be the responsibility of engineering or production.

Adapted from an address delivered at the Plant Maintenance Conference, held concurrently with the recent Fourth Plant Maintenance Show, at Cleveland.

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In our case, Plant Engineering, or as we term it, General Engineering, comprises the functions of providing, improving, and maintaining physical plant facilities, including production equipment; the supplying of utility services; and finally, the furnishing of engineering consulting services to the various plant departments as required. These functions are so closely related in a photographic plant of our type that we have found distinct advantages in having them centralized.

An exception is made in the case of our Camera Plant where production equipment, essentially of a machine tool nature, is selected by the manufacturing division. The engineering division works closely with production, industrial engineering, and research in reaching decisions on the facilities to be provided by engineering. It also works closely with accounting in their preparation of savings estimates required to justify projects.

Organization

The engineering division reports to the Assistant General Manager, on the same organizational level as production, research, and quality control. It consists of seven main groups reporting to the Chief Engineer and having the following responsibilities:

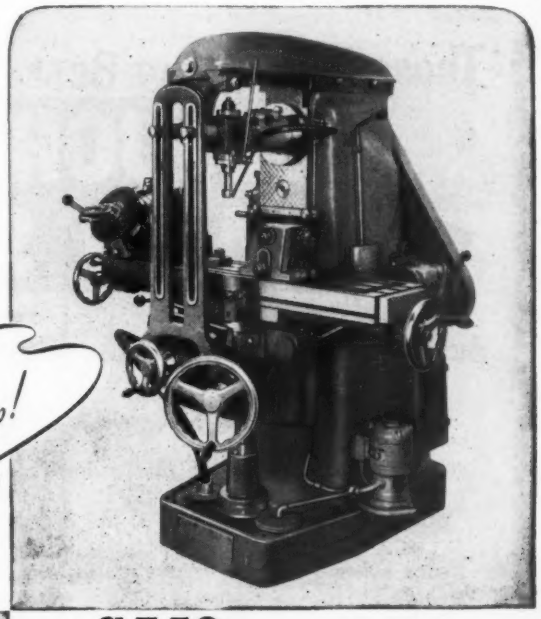
1. Building Design, Construction and Maintenance — whose function it is to design buildings and building facilities (including process air conditioning, layouts for process equipment, and electrical design); to supervise the construction of major buildings; and to schedule and supervise the maintenance of buildings.

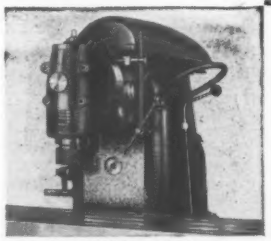
2. Machine Development and Design — whose function it is to develop, design, and, in some instances, build pilot models of special purpose production and processing machinery and devices not commercially available; and to carry out engineering investigations of a mechanical development nature.

3. Electrical Development and Instrumentation — whose function it is to develop, design, and, in some instances, build pilot models of special purpose servomechanisms, automatic controllers, and production test instruments not commercially available; to maintain electronic devices developed in our plant; to maintain process instrumentation; and to carry out engineering investigations of an electrical development nature.

4. Staff Engineers — whose function it is to coordinate the provision of major new capital facilities and to carry out special engineering investigations.

5. Production (i. e., Project) — Engineers and Shops — whose function it is to maintain plant facilities; to fabricate equipment designed in our plant; to install all types of equipment; and to





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coordinate the provision of new capital plant production facilities, excepting major projects.

6. Mechanical Stores and General Office — whose function it is to operate the engineering storeroom so as to insure the availability of necessary maintenance supplies; to prepare routine and special purpose reports, operating and capital budgets; and to handle stenographic and clerical duties.

7. Energies and Electrical Engineering — whose function it is to furnish all utility services (steam, electricity, water, air conditioning, refrigeration, inert gas, etc.); to determine quantities of utility services used by various plant operating units for costing purposes; to maintain utility facilities; and to handle all plant energies and electrical engineering problems, including drives and controls for process equipment, excepting new development work.

Staff engineers and production engineers act as project engineering managers. They are responsible for over-all work coordination but are not necessarily specialists in the several phases of the work. They are not, for example, responsible for the adequacy of specific design except to insure that the over-all requirements of the project are met. It is their function to make preliminary engineering studies, prepare appropriation requests for funds, investigate process equipment, prepare purchase requisitions for such equipment and, in some instances, for outside contractors' services. They issue shop orders for work performed by our shops, give engineering supervision to field installations, test or arrange for testing of facilities, and arrange for the closing out of projects and review of final costs.

Production engineers are responsible for maintenance and new work projects in their regularly assigned production areas, whereas staff engineers are concerned primarily with new work projects occurring in any plant area.

On the other hand, development, design, construction, electrical and energies engineers, etc., are highly skilled specialists in these particular fields, having the general responsibilities outlined above.

The engineering shops operate as a pool from which the necessary personnel engage in maintenance and new work as the work load demands. Basically, we operate a centralized maintenance system with the exception that approximately 20% of the total shop force is permanently stationed in various production areas to handle full time duties there. These area men report to engineering.

Our procedure followed in performing the engineering func-

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tions will be illustrated briefly by considering the following sample activities:

1. New capital project.
2. Engineering development project.
3. Repair orders.

New Capital Project

Each year, with occasional interim reviews, the Engineering Department prepares a capital expenditure budget of plant facility requirements for subsequent years, usually for a three year period but with more specific data shown for the first year's needs. Longer range plans are made as Management requests.

In the case of a specific new capital project, we have a procedure for furnishing management and the department requesting engineering services with an approximate cost estimate before spending any significant amount of time and money in preparing a formal request for funds. This procedure makes possible a preliminary screening of projects and thus minimizes wasted engineering effort. In our case, the department requiring project assistance sends to engineering a one page form called an "Engineering Request."

When the Engineering Request form is received by engineering, it is given a number which thereafter is used to identify the project. It is assigned to an engineer and a copy is circulated to those engineering supervisory or staff personnel who will have a part in performing the work should the project later be approved.

In the course of circulating the form, a cost estimate is prepared; and finally, the original, complete with cost data, is signed by the Chief Engineer. Ozalid copies are then made and distributed to those concerned with performing the work. One copy is returned to the department requesting service, and one copy is sent to management for review. Unless the project is cancelled, upon review of these preliminary estimates, Engineering proceeds with the preparation of a formal request for funds.

Our procedure for requesting funds varies with the nature of the project. For instance, on small projects where the engineering costs required to prepare a firm estimate do not exceed $500, it is our general practice to prepare one appropriation request for funds to cover the entire project. The $500 amount is approved when the above described "Engineering Request" is signed by the Chief Engineer.

On sizable or complex jobs, where the engineering costs required to prepare a firm estimate exceed $500, it is general practice for our engineer to pre-

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pare a formal request for funds to cover designs and, in some instances, to cover the cost of certain long term delivery equipment items.

The approximate total cost of the project is indicated on this request, together with a statement that a better estimate will be furnished in a subsequent request for construction funds following substantial design completion. Occasionally, we must deviate from this procedure of writing separate design appropriation requests. Where this deviation occurs, it is much more difficult to keep expenditures within appropriation limits.

The formal appropriation request is prepared on a standardized form. It includes such information as the scope and need of the proposed facilities; the estimated cost; the profitability, if any; the additional working capital requirements, if any; the expected rate of expenditure of funds; the starting and completion dates for the project; and the amount of money being specifically requested.

Following Management approval of the design funds, or possibly before, if project urgency warrants, it is the engineer's responsibility to work with the customer department in setting up operating requirement specifications for the facility required. Requirement specifications outline such information as desired machine speeds, product sizes to be produced, temperature and humidity needs, etc., but generally do not define how the needs are to be met, since it is the engineering department's responsibility to provide the facilities required to meet the need.

One of the first decisions which has to be made, assuming considerable design work will be required, is whether the design work shall be performed in our own design division or whether it shall be performed by an outside engineering firm. We have no definite rule in this regard and the decision depends upon other design work load, nature and size of project, and the time element.

Where an outside engineering firm is retained, a design coordinator is appointed, generally from our own design department. It is his job to insure that our needs are met and to insure the necessary coordination between those phases of design carried out in our department and that performed by the outside firm.

In the case of major projects, after design has progressed to a point where a reasonably good estimate can be made, a second fund appropriation request is prepared covering construction funds. Following this fund approval and completion of design and specifications, purchase

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requisitions are prepared for equipment and necessary material procurement, shop orders are issued for work to be done by our shops; and, where building construction is involved, a reliable contractor is selected for this work, usually on a lump sum bid basis of contract award.

When a new building is ready for the installation of production machinery, such installation is coordinated by the construction supervisor but the project engineer furnishes technical assistance or calls upon others for same. The project engineer, with the assistance of design specialists and others as required, is responsible for test runs on production equipment and piloting it into readiness for production operation. At the conclusion of the work, it is the project engineer's responsibility to see that all requirements have been met, that the costs and their distribution are proper, and to initiate closing out of the project.

A periodic review is made of the money spent on projects for the purpose of estimating whether the work can be performed within appropriation limits. Where the cost of a project exceeds or is expected to exceed the approved appropriation by more than 10%, we request Management approval of the additional needed funds. If the cause for the increased cost is due to a change in scope in the project, the appropriation request form is called a "supplement" whereas, if the cause is due to greater cost than anticipated, the appropriation request form is called an "overrun".

Projects justified on a savings basis are checked by the accounting division after six months of operation to determine whether or not the expected savings are realized.

Progress reports are issued monthly for all new work projects.

Engineering Development Project

A development budget is set up at the beginning of each year to cover the year's requirements. Regular meetings are held throughout the year between Management, engineering development personnel and those requiring such services in order to review the status of active development projects, to establish priority of work, to discuss potential new projects, and, where the situation warrants, to defer or cancel existing projects.

Where the economic or other need justifies a piece of equipment and where the equipment is not available commercially or not enough is known about the principle to permit direct design, the project is assigned to a development engineer. Such projects are initiated by a letter from the department requiring the service, a somewhat less

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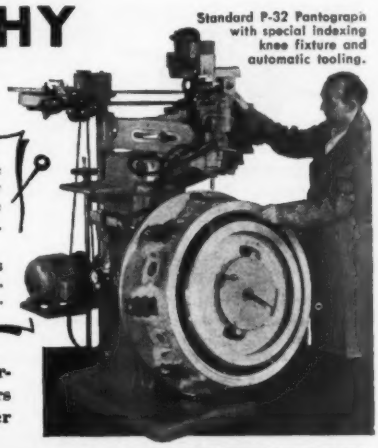

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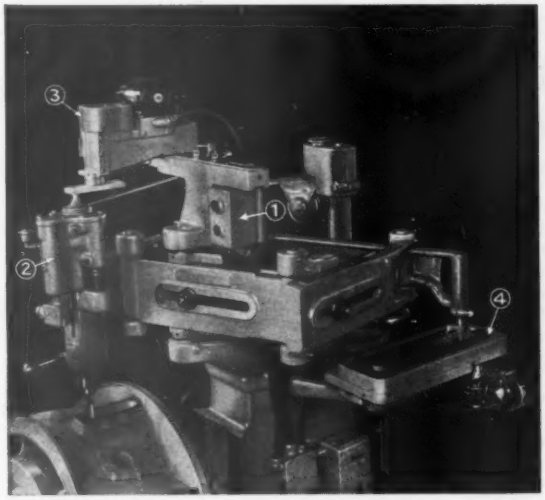

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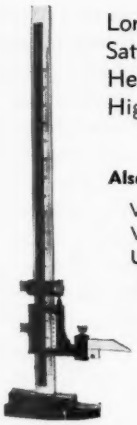

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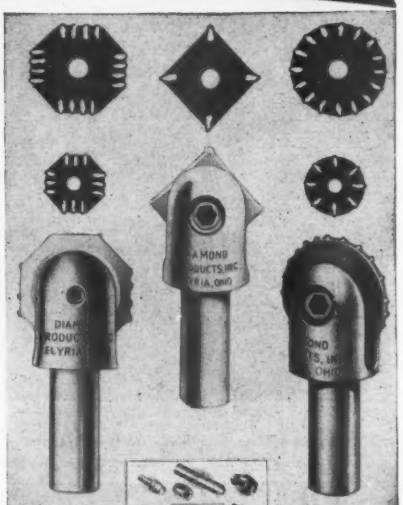

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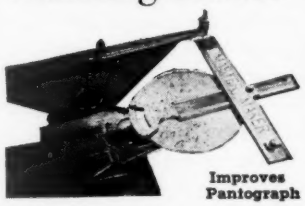

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formal basis than is used in the case of new capital facilities. It is the general practice, where possible, to furnish the department requesting development service with an approximate estimate of cost of a facility.

The development engineer coordinates all phases of the work on the project and supervises the building of a pilot model or, in some instances, a first production model. In the event that the development work is successful, formal papers are initiated for capitalization of the item. In carrying out his responsibilities it is necessary that the development engineer also be well versed in commercially available equipment so that he may make maximum use of same and, further, so that he will not waste time developing items which can be purchased.

Small but well equipped mechanical and electrical laboratory facilities are available for this work. These areas are partitioned off from the regular shop areas and are under complete jurisdiction of the engineering development groups. Sufficient machine tools are available in the laboratory to permit the fabrication of many small parts, with others requiring the services of our main shops.

Repair Orders

A written order is prepared for every repair job, regardless of size, except for a few emergency repairs and certain routine items, such as oiling and greasing. Emergency order numbers are assigned later. Oiling, greasing, and minor adjustment work is charged to a specific account for each department, generally without a work order issued.

Basically we use two types of forms for repair orders. One of these is a green colored sheet called a "Work Request" on which orders are written for repair jobs estimated to cost less than $100 each. Individual job costs are not reported for work covered by these orders. Instead, a monthly report is issued showing the total costs of all orders for each department.

The second form is a white one. It is used for all shop work where specific job costs are required: For every repair job estimated to cost in excess of $100, for those jobs estimated to cost less than $100 whose specific costs are required, and for standing orders covering all repair and maintenance work in a particular area or piece of equipment for a definite period of time. This form is also used to initiate shop work on new capital projects. Individual shop order costs are reported monthly for all white shop orders.

These repair work orders may be initiated by any one in the plant areas. The green orders require the approval of the first

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Fast, burrless cut-off and slitting or slotting with with Dual Drive which makes stresses and breakage negligible. Let M & M Triple-Chip saw blades give you the higher production-with-accuracy which Industry must attain and maintain today. Also Master-Cut conventional type with M & M's exclusive Dual Drive. Ask your dealer.
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ALSO TRIPLE-CHIP ANTI-WELD SOLUBLE OIL
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THE MOTCH & MERRYWEATHER MACHINERY CO.
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ALL 3:

line supervisor in the area requesting the work. White orders require the approval of the department manager requesting the work, plus the approval of the Chief Engineer. Those orders estimated to cost in excess of $1,000 also require the approval of the Assistant General Manager or General Manager.

We utilize an index of maintenance man-hours per thousand Kw-hours of electrical consumption to give an overall indication of the maintenance efficiency in relation to prior periods. This index is prepared for the total plant and for major subdivisions of the plant. It has been determined that there is a relationship between the man-hours of maintenance required to keep the plant in good operating condition and the Kw-hours of electrical energy used by the plant. This relationship provides a useful tool in determining maintenance man-hours, maintenance material costs, and energies costs.

We have set up a preventive maintenance program on a limited basis and are gradually extending it. At present, most progress has been made in the case of electrical equipment where a card system has been established for a large percentage of the plant motors and controls and from which scheduled inspections are ordered and repairs made as needed. Because of the nature of our manufacturing operations outlined above, it is a very difficult problem to schedule maintenance. Consequently we have a relatively high percentage of weekend overtime work and a large amount of accumulated work which is performed during the annual plant shutdown which generally lasts three weeks.

Annual Report

Each year-end we prepare, for Management's information, an annual report showing the results of the year's engineering activity, together with data for the previous year, in terms of work accomplished and costs for such items as new capital facilities, engineering development, plant maintenance, and utility services. This report also is a valuable reference for engineering supervision.

These comments on how our engineering department operates are not intended to imply that our procedures are suitable for others or that they are best for our own case. They represent our current practice which we are continually improving.

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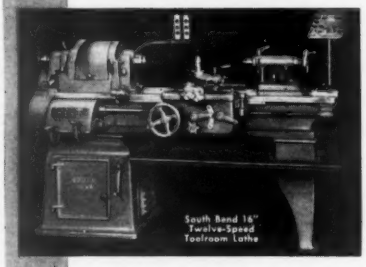
12-SPEED LATHE

The wide range of spindle speeds on this new lathe cuts machining time because the operator quickly selects the right speed for each operation. Pushbutton control provides a fast change from any high speed to the corresponding low speed. Its 48 longitudinal and cross feeds assure maximum efficiency on every job. Also, you will find that its accuracy and ease of operation make your tough jobs easy. Send for catalog.



SPECIFICATIONS
Spindle Speeds (approx.) Direct: high range 300, 550, 945; low range 150, 278, 475. Back gear drive: high range 32, 70, 118; low range 20, 33, 60.
Spindle Bore — 1⅜".
Swing over bed — 16¼".
Swing over saddle cross slide — 9⅜".
Distance between centers — 33¼", 45¼", 57¼", 81¼", 105¼".
Collet Capacity — 1" maximum.
Thread Pitches — 48, 4 to 224 per inch.

SOUTH BEND LATHE
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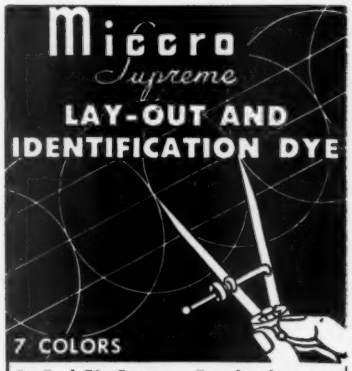

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SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

. . . Hardness Testing, from page 72

tion of the ball as above described defines the indentation perfectly without enlarging it, or without unduly wearing out the ball penetrator.

Fatigue Resistance Revealed

An important recent development in physical testing of metals is the disclosure that when a given metal is studied by the dynamic hardness technique, as well as by Brinell procedure, the fatigue property of the metal (or its capacity to absorb shocks and stresses without re-crystallization) is precisely revealed. Many in the past have practiced estimation of metal strength from Brinell hardness values. Many authorities have been convinced that the percussion or rebound technique is directly proportional to resistance to abrasive wear, or indicative of the capacity of a metal mass to resume its physical stability after shock.

Thus, postulating any two metals with equal strength, it is often assumed the one having the highest dynamic value will show the longest worklife under continual stressing. Therefore, through use of suitable hardness testing instruments, different castings or forgings may be selected having capacities or working characteristics equal to some proven specimen. Many feel that this method of selection (which is very easily followed) is both definite and dependable.

Motor-driven hardness-testing machines are often ideal for tests where speed of operation is essential, and where accuracy in determination of the Brinell number is a significant factor. One unit of this type incorporates a rotary pump which hydraulically applies the load smoothly and quickly, without any pulsations to the packless loading cylinder. The hydraulic pump is operated by a vertical motor, and there is a knurled screw which operates a check valve. This check valve controls automatic cut-off of the load, making it possible to check the load anywhere from 500 kilograms to the 3,000 - kilogram capacity of the machine.

Some Brinell testers are of high speed production type, equipped with two dials, the one directly below the other. These allow adjusting the load as required. The upper dial on this machine indicates the load in kilograms, which is being applied on the ball indenter. The lower dial indicates the depth of hardness impression.

Unit Incorporates Hydraulic Accumulator

One very interesting Brinell hardness tester is of the dead weight type, yet is fully hydraulic in operation. This unit is operated by hand, but is

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nevertheless convenient and easy to use. It uses a hydraulic accumulator for weighing and load maintenance. The distance between the ball indenter and the supporting platens is adjustable from zero to 12" by means of a handwheel and a removable table post. The hydraulic pump plunger on this machine is actuated by a handwheel, through pinion and gear. Connection between plunger and gear is such that with increasing penetration and load, the lever-arm on which the load is applied becomes shorter.

Thus, the oil supply per unit of handwheel motion becomes less with increasing loads, and the accumulator weights are raised slowly, smoothly, and with a minimum of manual effort. Weights are mounted on the accumulator, and the accumulator weights are directly proportional to the load on the specimen. There is a spring connection between accumulator weights and accumulator plunger, which causes the weights to begin moving slightly below the maximum load. Since the weights are already in motion at the time maximum load is reached, inertia has been effectively overcome.

Both stationary and portable Brinell hardness testers have been found highly convenient. Some plants find it advantageous to place a hand-operated or motor-operated Brinell hardness tester on a semi-portable mount, so the complete unit is easily movable, even though it may be quite heavy. Some hardness tester manufacturers install standard Brinell units on a truck mounting, so arranged that the machine may be swung around, raised up and down, or readily moved to any desired point, to facilitate testing stock in storerooms, etc.

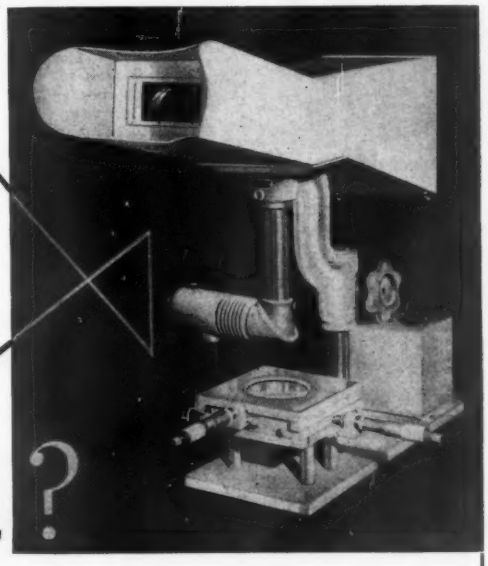
Microscopes Measure Brinell Impressions

Impressions made during Brinell hardness tests may be measured with the aid of a Brinell microscope, or by means of special instruments developed for measuring impression depth. Different Brinell microscopes are available. One compound microscope provided for this purpose permits great accuracy. It consists of a body tube on a circular base, which has a 15 mm aperture for viewing the specimen. Sliding in the body tube is a focusing tube, carrying a Ramsden eyepiece and 32 mm achromatic objective. When the focus is obtained, the focusing tube may be secured with a special clamping ring provided.

One very fine Brinell microscope is equipped with an attached illuminator. Use of an illuminator facilitates quick and easy reading of indentations,

. . . *Continued on page 110*

HOW BIG IS BIG?



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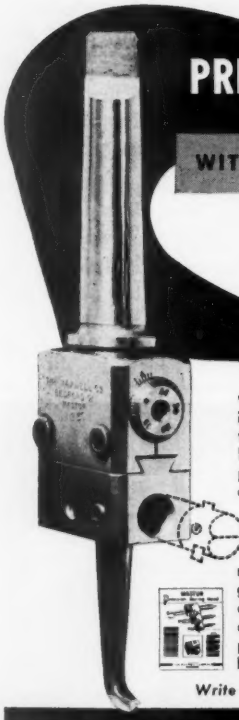
PRECISION BORING WITH MAXWELL MASTUR TOOLS



• Adjustable to 0.0002-inch, the new improved MASTUR boring tools feature precision, speed and long service life. New body and block construction permits these tools to take heavier cuts at higher speeds — to do more work in less time.

Adjusting-screw head is graduated into 50 divisions to provide readings in thousandths, and body is graduated to permit vernier readings of 0.0002-inch. The three models available have maximum boring bar capacities of 1/2, 3/4 and 1-inch and boring range from 3/8 to 15 inches.

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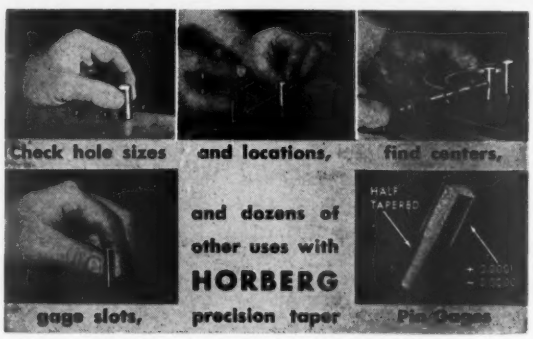

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CONCENTRIC TAPER on lower half of each gage fits holes 0.0012" smaller than standard letter, fraction, and number size drill holes. Makes insertion easier. Permits gaging of odd-size holes and slots.

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Severance INSIDE DEBURRING CUTTERS

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Select 45° High Speed cutters from 28 standard sizes and 30° cutters from 35 sizes—from 1/4" to 2" diameters.

45° 30°

Both angles can be supplied in CARBIDE

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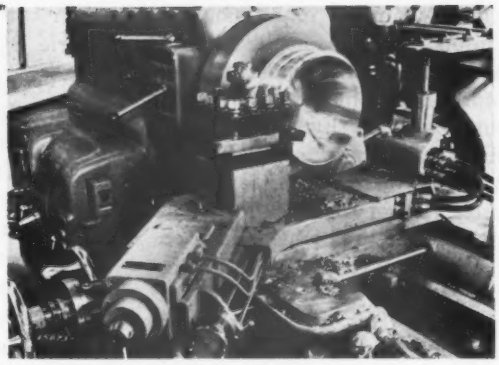


Fig. 1. Preparatory cuts taken with roughing tool on outside diameter match inside diameter to exacting dimensions. Stylus and template are seen at upper right with tracer valve.

Duplicating Difficult Contours

Machining of difficult contours for guided missile parts at Rheem Manufacturing Co., Downey, Calif., is simplified by equipping standard lathes with hydraulic duplicators.

In turning the inside and outside diameters of these air tank heads, 23 lbs. of stock at 12" dia. must be removed from rough forgings of 4130 aircraft steel. This is accomplished to the +.005 −.000 tolerances specified.

A full spherical radius had to be cut inside. The contour starts straight, blends into a 2¾" radius, and then blends again into an 8" spherical radius. By ordinary methods this seemed almost impossible, but the problem was easily solved with the installation of hydraulic duplicators.

A stylus point follows the template to guide the tool by power cross feed, reproducing the exact contour in the part. The ease of set-up and simplicity of tooling with this attachment provided many advantages, including use of conventional tools which produce a better, smoother surface finish than can be obtained with costly form tools. The finish tool used for making the final cut requires no adjustment for size from rough to finish machining as the tools are set in proper relation in the original set-up. Facing to length, inside bore, and radius to centerline are all controlled by the template and the first size setting when set-up is made. Calipering is confined to the first diameter only with subsequent diameters obtained automatically.

Machining time required is only 68 minutes to complete the part shown as compared to the conventional method of 3 hours.

The duplicating attachment will meet any combination of the lathe's feeds, speeds and tooling. Attachments for converting any standard machine tool to fast automatic duplicating are also built, thereby making possible increased versatility, simplification of difficult work and the substantial reduction of machining costs.

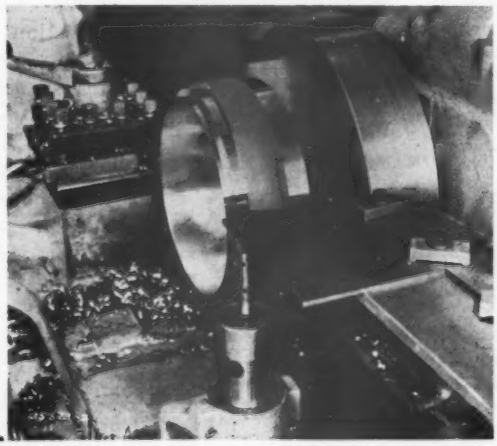
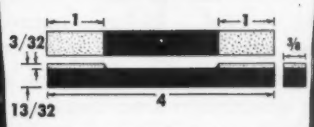


Fig. 2. Photograph shows finishing O.D. of guided missile part. No adjustment required for size when changing from rough to finish, as tools are set-up in proper relation. Job accomplished in 68 minutes by duplicating method. Conventional way required 3 hours.

Photos courtesy Turchan Follower Machine Company

DIAMOND HONES



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. . . Hardness Testing, from page 107 and definitely relieves eyestrain where a great many tests must be read in succession. The illuminator on this microscope may be connected to any electric light socket. Before impressions are read, the eyepiece of the instrument is adjusted so that graduation lines reading to 1/10 mm are plainly visible.

One Brinell microscope, designed for very accurate readings of diameter impressions, is equipped with a so-called counter. With this attachment, Brinell impressions made by a 10 mm ball, or by a pyramid-shaped diamond, are read between two sharp knife edges, to an accuracy of 1/100 mm. If the three figures which show on the counter read 311, it means the diameter of impression is 3.11 mm. This microscope also has an illuminator attached, which can be connected to any electric light socket.

Certain microscopes provided by one manufacturer of hardness testers for use with Brinell testing machines are designed specifically for the purpose, and include a really fine optical system. A porcelain checking scale (used in checking the markings on the microscope scale) is included with these instruments. There are two different types, differing in reference to illuminators used. One of these is arranged for illuminating the Brinell impression by a small electric bulb, operating from a 110-volt, 60-cycle, single-phase current. On the other, illumination is provided by a small, self-contained standard flashlight battery and bulb.

Brinell Depth Reading Devices

Certain instruments used for direct reading of Brinell tests are really depth reading devices. Depth and diameter readings, especially on hard material, are hardly ever in agreement, due to some flattening of the ball taking place while the test is being made, and to a certain amount of recovery in the specimen. Nevertheless, such indicators may be used to advantage on large production work. A test piece is selected which shows correct specified hardness when read by the Brinell microscope, and at the same time the indicator reading on the dial is noted. Afterward, all test pieces showing the same dial reading will have the same hardness number. This procedure eliminates considerable time-wasting reading of a microscope where large numbers of uniform pieces are to be measured.

Some depth measuring instruments for Brinell impressions have a dial on which depth is automatically indicated, and are for use on hydraulic hard-

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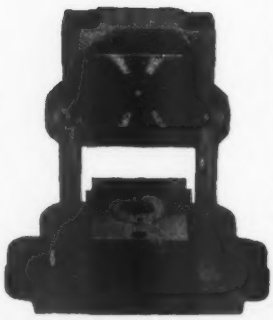

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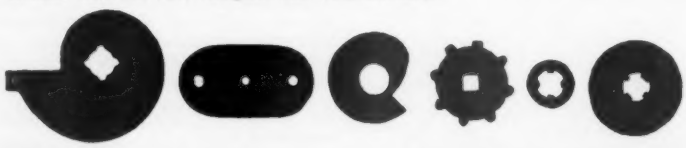

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ness testers. Such an instrument can be read either with the load on, or after load has been removed. There are two limit hands on the dial. These can be set between any two values of depth desired, corresponding to Brinell hardness readings as secured by a microscope. Use of such a measuring instrument facilitates making Brinell tests in production.

Various Brinell testing machines have been developed for special purposes. A case in point is hardness testing of large and heavy plates. On one tester which easily accommodates very large and heavy plates, there is no handwheel or other elevating device to be manually manipulated, but the plate is supported on a hydraulic elevating cylinder. It is automatically brought in contact with the penetrator by rotating a loading handle about ⅛ turn.

When contact has been made, this loading handle is further rotated, to its limit. This locks the hydraulic elevating support in correct position while the impression is being made at 3000 kg load. After the load has been applied for the time required, the loading handle can be returned to its original position, whereupon the piece under test can be quickly removed.

12-Inch-Thick Plate Tested

One special Brinell hardness testing machine designed for testing armor plate up to 12″ in thickness, is hydraulically operated, and has a 24-inch throat depth for reaching out over the plate. This tester is designed for operation in connection with a conveyor system, and is mounted on wheels. This arrangement facilitates moving the tester in and out over the conveyor system. However, the unit is adaptable for other applications.

Some Brinelling machines are particularly designed for large and heavy pieces. These have a base near the floor, on which the work-piece to be tested is mounted. Above this base, a cross-head operates up and down on two vertical screws, by means of a speed reducer.

To Be Continued Next Month

Industry News

With the increased facilities provided in their new building The Swedish Gage Company and the C. E. Johansson Gage Company, a division, are in a position to render better service to American Industry. The building includes, besides the office and manufacturing space, an instrument assembly room, a gage block room, inspection room and lap room. The gage room is unique in that the air conditioning is constructed so as to eliminate all drafts and maintain a constant temperature of 68°.

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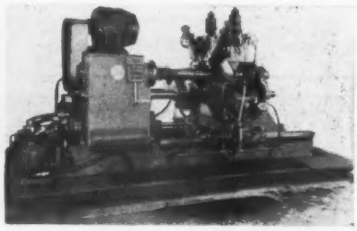
Superfinishing Mill Rolls

Maintenance of mill rolls is a never-ending problem. A well-known rolling mill, which produces stainless steel strip stock, decided to make some tests. The objective was two-fold. First, they wanted to extend the working life of the individual mill rolls. Secondly, they wanted to reduce the time and expense of refinishing the rolls. Special arrangements for this test were made with the manufacturer of the superfinishing machine shown in Figure 1.



Photos courtesy Gisholt Machine Co.

Fig. 1. Mill Roll Superfinisher shown will superfinish a mill roll in 15 minutes or less. Operation is completely automatic and machine will handle 60" between centers, with 36" roll having 20" diameter.

Test rolls were shipped to this manufacturer to be superfinished. These were then returned to the mill. In production it was found that one set of superfinished rolls ran 36 machine hours, as against less than 8 hours for a similar set of ground rolls. In another test it was found that superfinished rolls would handle 280,000 lbs. before refinishing, as against less than 100,000 lbs. with ground rolls. In a salt spray test it

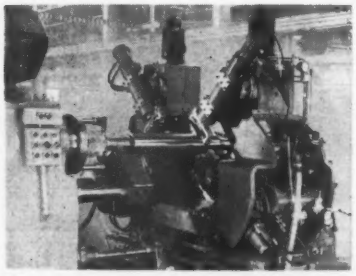


Fig. 2. Close-up shows four superfinishing heads with bearing support and driving adapter. Stones oscillate and traverse to scrub away amorphous metal.

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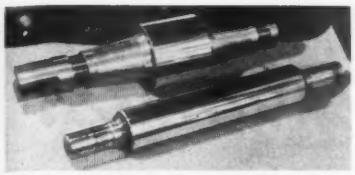

Fig. 3. Two of many size rolls used in rolling stainless steel strip sheet. Surface roughness of superfinished roll measures maximum of 1 micro inch rms.

showed there were less iron inclusions in the stainless steel rolled strip when the mill roll had been superfinished.

Based on these tests a Mill Roll Superfinisher was ordered and is now in use in this plant. The machine has a completely automatic cycle and is adjustable to handle a wide variety of mill rolls up to a 20" diameter and 36" roll working surface. Rolls with a single or double crown measuring from .001" to .007" are also handled on this machine.

The cycle starts with the operator loading the roll into the machine. The roll is driven

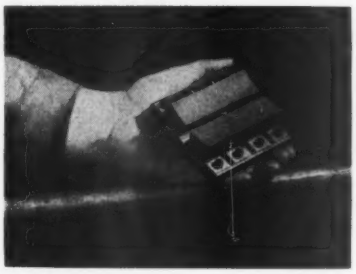

Fig. 4. Each of four superfinishing heads carries this quick-change stone-holder. The stones are vitrified bonded abrasive. Note that each stone is dressed to the work radius to give an area rather than a line contact.

with a special adapter, is supported with a tailstock, and rests on its own bearings. As the roll is driven, the superfinishing stones contact the work and are oscillated and traversed back and forth over the length of the roll. Three automatic changes of spindle speed give roughing, semi-finishing and finishing operations. At the completion of the cycle the spindle brake is applied, the roll is wrapped to protect the superfinished surface and is then removed from the machine.

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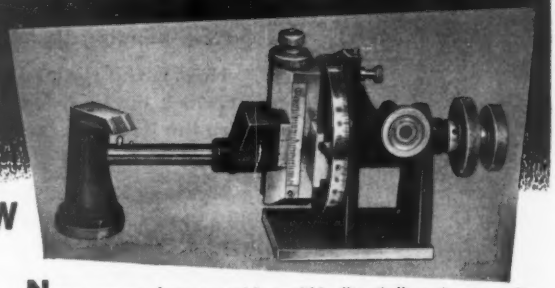

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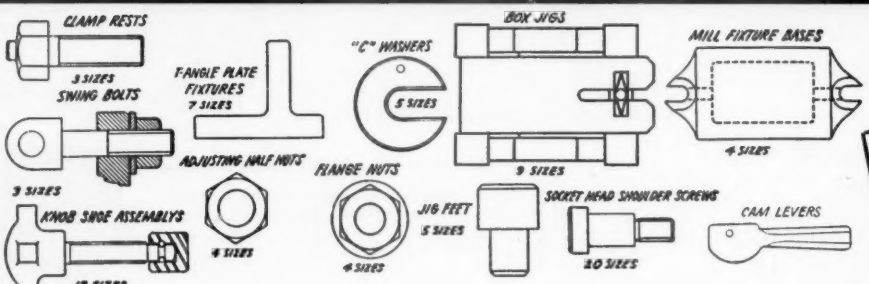

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9	24	38	71	84	98	105A	112B	122B	127	131D	137A	142A	146B	151C	158
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11	26	57	73A	86	100	105C	112D	122D	128B	132B	137C	143A	146D	152A	
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13	28	60	74	88	102A	107	113A	123A	128D	133A	138A	143C	148B	153A	
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7	22	36	69A	82	96	104C	111	120C	126A	131B	136A	141D	145E	151A	156
8	23	37	69B	83	97	104D	112A	122A	126B	131C	136B	141E	146A	151B	157
9	24	38	71	84	98	105A	112B	122B	127	131D	137A	142A	146B	151C	158
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11	26	57	73A	86	100	105C	112D	122D	128B	132B	137C	143A	146D	152A	
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A3	A17	A31	B10	B24	B38	B52	B66	B80	B94	B108	B122	B136	C8	E10
A4	A18	A32	B11	B25	B39	B53	B67	B81	B95	B109	B123	B137	C9	E11
A5	A19	A33	B12	B26	B40	B54	B68	B82	B96	B110	B124	B138	C10	E12
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A7	A21	A35	B14	B28	B42	B56	B70	B84	B98	B112	B126	B140	C12	E14
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World's Largest Scrap Handling System

One-man controlled conveyor network collects scrap from presses, transports it to baler house and discharges bales into freight cars on outdoor sidings

What is reported to be the world's largest scrap handling system — having a scrap capacity of 500,000 pounds a day — has been conceived and designed by the Central Works Engineering Section of Fisher Body Division, General Motors Corporation. It was constructed for their Grand Rapids Plant No. 1.

Backbone of the system is a 4½-foot wide main scrap conveyor which measures 1144 feet 9 inches long. Belting for this conveyor is fabricated from standard 9-inch pitch May-Fran steel links, with 6-inch high side wings on the outside links. Normal carrying capacity is 40 pounds per lineal foot, and the belt can travel at variable speeds up to 45 feet per minute. Power is supplied by two 10-horsepower motors geared by a Reliance variable speed drive with an 8:1 stepless range.

Twenty collecting conveyors, ranging from 61½ to 165 feet in length, travel at right angles to the main conveyor beneath the pressroom floor. These collection conveyors receive loose scrap from a chute located under each of the presses on the floor above and carry it to the main conveyor. Each of these units has a 24-inch wide belt fabricated from standard 6-inch pitch steel belt links and having 3-inch high side wings on the outside links. They are powered by 3 or 5-horsepower motors, depending upon length, and have Reeves varispeed pulleys of 3:1 ratio. Operating speed ranges 15 to 45 feet per minute, and the carrying capacity is 30 pounds per lineal foot.

Unique design of the hinged-steel belting makes possible the handling of a wide assortment of scrap sizes generated by the presses.

The belt and its load are supported by an angle-iron framework attached to the floor. Lubrication for the main conveyor is directed to the underside of the belt at one point by a continuously operating Alemite Oil-Mist system. A safety switch automatically shuts off the power if underside of the belt, which is designed to have a certain amount of slack, tightens to a predetermined point.

Scrap travels on the belt conveyor from main plant to baler house. To prevent fall-back as scrap is carried up a steep incline into baler house, angle-iron cleats have been attached at regular intervals to the belt links. The scrap then drops off the discharge end of main conveyor into a tilting hopper which, in turn, dumps it into two parallel balers. The operator can direct contents of the hopper into either baler. The conveyor automatically stops moving until hopper comes back into receiving position.

The baler compresses loose scrap into a bundle averaging 24 x 16 x 16 inches in size and weighing between 600 and 800 pounds. The bale is then ejected onto a 53-foot long 4½-foot wide conveyor and is pushed along to an outside discharge chute by steel sections attached to two side chains, which are driven by a 7½ horsepower motor. Bales slide down the curved chute to discharge into railroad flat cars standing under the discharge end of the carry-off conveyor. To remove loaded cars and bring up empty ones, a reversible May-Fran car-pulling conveyor has been installed outside the building. This is capable of moving 300 tons at 6 feet per minute.

The main scrap conveyor, tilting hopper, balers, baled scrap conveyor, car puller conveyor and chute hoist are all operated by one man from a single control station located in the baler house.

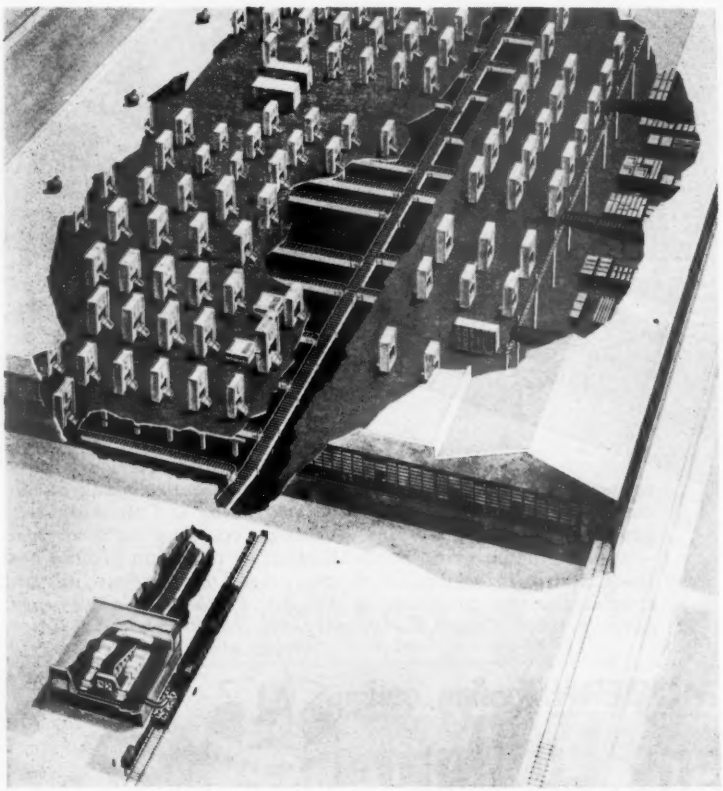
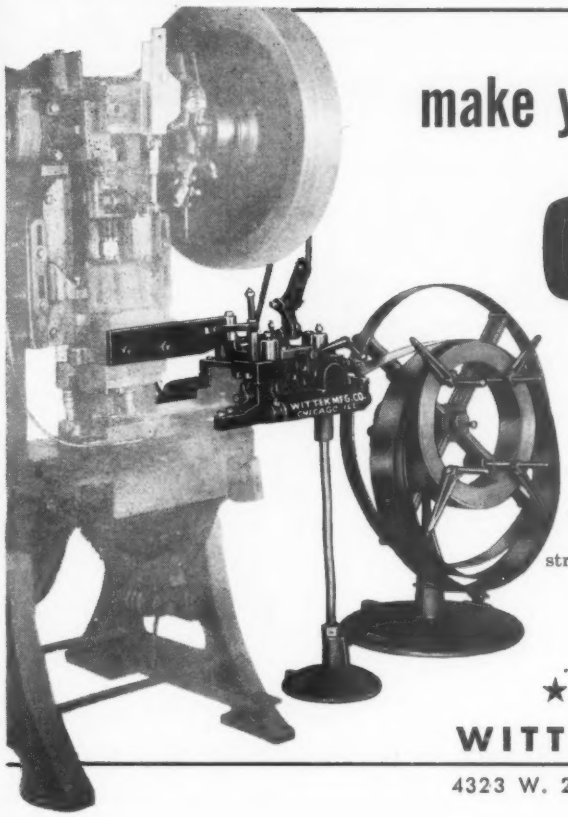


Photo courtesy May-Fran Engineering Inc.



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Wittek Reel Stands facilitate handling coiled stock.

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Zagar GEARLESS DRILLHEADS *excel* for drilling on close centers

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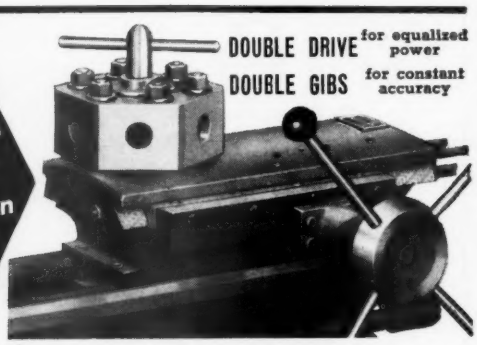

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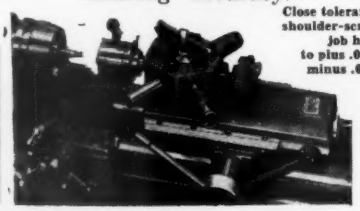

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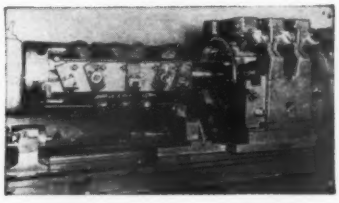
covers capacity range from 15 to 300 tons. Straightening presses have self-contained power unit, and adjustable stroke control in both directions. The forcing presses have 2 speed ram advance, and extra large table for maximum versatility. Stroke may be pre-set both ways, and semi or fully automatic cycling is available. All steel welded construction. **Inform-A-Gram No. A1.**

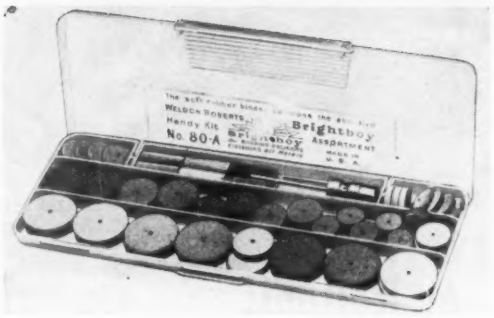
This Machine Is Specially Built for the complete machining of a jet engine compressor case, is available through Morey Machinery Co., Inc., 410 Broome St., New York 13, N. Y. Design is two piece. The boring bar is of rigid design with temporary support during loading. The tool



slides are mechanically actuated and hydraulically controlled.

Both halves of the housing are clamped in the fixture by a series of self-locking, spring loaded blocks. The carriage then advances the work over the boring bar. This is then inserted in an outboard support bearing and the temporary support is retracted. **Inform-A-Gram No. A2.**

By Brightboy Industrial Division, Weldon Roberts Rubber Company, 6th Avenue & N. 13th Street, Newark 7, N. J., these abrasives will finish all metals, plastics, wood, glass, hard rubber and laminated materials and combinations. They've recently been issued in this useful, low-cost kit. Time savings in finishing ops. to 50%.



Handy Rubber Cushioned Abrasives Kit. A unique, smooth surfacing action is achieved by light abrasive and rubber combined, in a simultaneous burring, finishing, and cleaning that constitutes a refreshing concept of finishing quality and versatility. Time savings frequently amount to 50% over customary methods and materials. Special surfacing effects can be obtained by regulating the speed of the machine and/or the pressure on the product being finished. An assortment of 44 pieces of small wheels and cylinders most frequently used with light power equipment, together with a chuck and mandrel make up the kit, which comes in a clear plastic case through which contents are visible.
Circle Inform-A-Gram No. A3.

The New Bath Press Type Brake combines the principle functions of the press brake and the stamping press into one machine of great versatility and speed. On the 30″ wide bed you can do blanking, piercing, shallow draw, bending, trimming, etc., at a standard speed of 45 strokes per minute or as high as 60 on fast light work. Closed side housings, oversize slide areas,

end feeding, and a new direct-acting clutch-brake combination needing no wear adjustment are among the many outstanding features. Ram and bed are mounted flush with housing face, eliminating the dangerous practice of reaching in under the ram. Standard stroke 5″, shut height 14″ with ram adjustment of 5″. Standard rating 150 tons. Cyril Bath Machinery Co., 6933 Machinery Ave., Cleveland 3, Ohio. **Circle No. A4.**

T-Slot and Dovetail Cutters *by* Reltool!

● Reltool T-Slot Cutters, both straight and taper shank, have staggered teeth and undercut with side chip clearance. Greater chip room results in freer cutting action, reduces breakage.

● Reltool Shank Type Dovetail Cutters for use in Reltool End Mill Holders take the place of arbor type and threaded hole angle cutters. Reduced set-up time and easier handling mean greater efficiency in milling dovetails.

The RELTOOL Line Includes: Combined Drill and Countersinks • Cut-off Blades • Die Sinking Cutters • Dovetail Cutters • End Mills • End Mill Holders • Hollow Mills • Key Seat Cutters • Lathe Centers • Lathe Mandrels • Machine Countersinks • Metal Slitting Saws • Milling Cutters — all types • Screw Slotters • Tool Bits • Specials.

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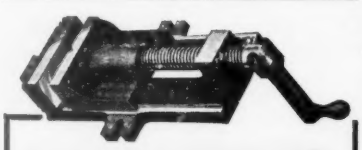

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● **This new Yost vise has been designed expressly for use on drill press operations. Does away with special and costly jig fixtures.**

OFFERED IN TWO SIZES

Vise No.	Width of Jaw, Inches	Opens Inches	Weight Pounds
1D	3½	4	12½
2D	5	5½	23

Do you need a vise of ANY type?
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1000 MAIN STREET
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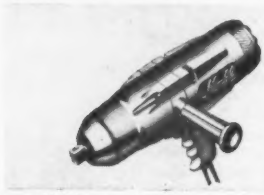
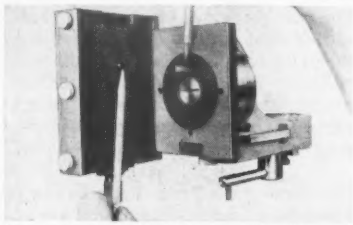
New Big Capacity Impact Wrench by Mall Tool Co., 7725 S. Chicago Ave., Chicago 19, handles up to ⅞" nuts and bolts. Features include die cast aluminum housing, pistol grip, detachable handle and forced draft



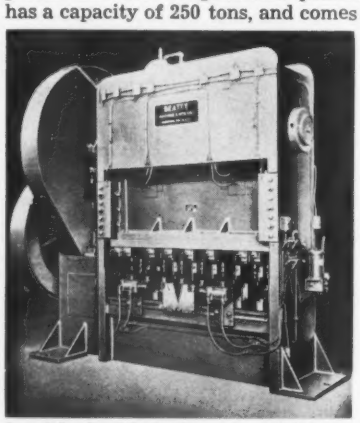
ventilation. Also heavy-duty reversible universal AC-DC motor of 115 or 230 volt current.
Circle Inform-A-Gram No. A5.

Two Dressers In One. #REC wheel dresser has detachable micrometer base for cylindrical and surface grinding to .0001" accuracy. It can also be used for 'under-the-wheel' dressing. Without dovetails 2 angles



tangent to a radius can be dressed with full accuracy in one continuous motion. The diamond automatically returns to center after dressing the angles. Complete data from J. & S. Tool Co., Inc., 644 W. Mt. Pleasant Ave., Livingston, N. J.
Circle Inform-A-Gram No. A6.

#10 Guillotine Plate and Angle Punch by Beatty Machine & Mfg. Co., Hammond, Indiana, punches angles, webs of sections, or flat plates. The No. 10 guillotine punch has a capacity of 250 tons, and comes



furnished with tools and positioners. Distance between housings is 74 inches. The ram is 72 inches long, right to left; 24 inches front to back; and has a stroke of 2½ inches. The drive is of the mechanical type. Literature now ready.
Circle Inform-A-Gram No. A7.

LINDERME 2-SPINDLE ADJUSTABLE DRILLING HEAD

Drills, taps metal, wood, plastics. 2-minute setup on most drill presses; quick, accurate adjustment. Variety of models, ½" to 12⅝" centers.

The drill spindles are held rigidly in position when two nuts are tightened. Sturdily constructed. Suitable for adaptation to large or small drill presses. Models A and B made with sleeve. Models C and D with overarm adaptation, equipped with guide pins, springs and brackets, mounted to a cast-iron base with surfaces ground for use of drill fixtures. All models can be used for drilling or tapping on tapping machine or drill press with reversible spindle. Also used with standard tapping heads.

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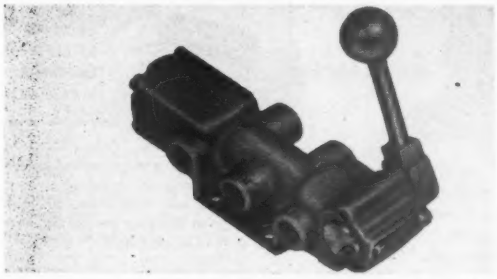
The Model #4 Utility Hand Dresser, now available from L. Newman, 1001-24th Street, Oakland, Calif., is equipped with precision, sealed ball bearings, and is perfectly balanced for hand use on bench or pedestal grinders. Literature from the manufacturer has all data on this and other models in a range of emery dressers, including #5 for cylindrical grinders which features adjustable base. **Inform-A-Gram No. A8.**

New Rotary Broach Sizes. Previously made in sizes from ¼"-1" by sixteenths and from 1⅛" to 1½" by eighths, this tool is now being made by the Shearcut Tool Co., 7045 Darby Ave., Reseda, Calif., in all sizes from 1/16" to 3" in 1/64" increments. Design gives tool life to 50 times greater than the standard reamer, eliminates bellmouthed, uneven or oversized holes. **Inform-A-Gram No. A9.**

Modern Design and Application Versatility keynote the ⅛" and ¼" NPT size line of pneumatic and hydraulic valves by Versa Products Co., Inc., 249 Scholes St., Brooklyn, N. Y. All types incorporate balanced pressure spool design. **Inform-A-Gram No. A10.**



Flamemaster Mark 11 Hand Torch from Tonea Hamilton & Associates, 5731 Wilshire Blvd., Suite 202, Los Angeles 36, Calif., is versatile enough to be the answer to a great many problems in the industrial field. It's suitable for light alloy welding, lead burning, soldering, and electrical engineering and electronics uses. Burns natural gas, butane or propane with compressed air or oxygen, hydrogen where needed or necessary. Thumb control for gas supply, automatic turndown for economy when not in use. **Circle Inform-A-Gram No. A11.**

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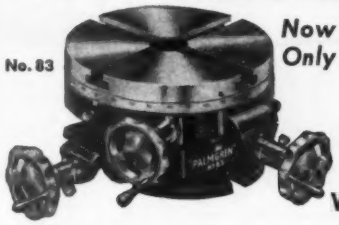

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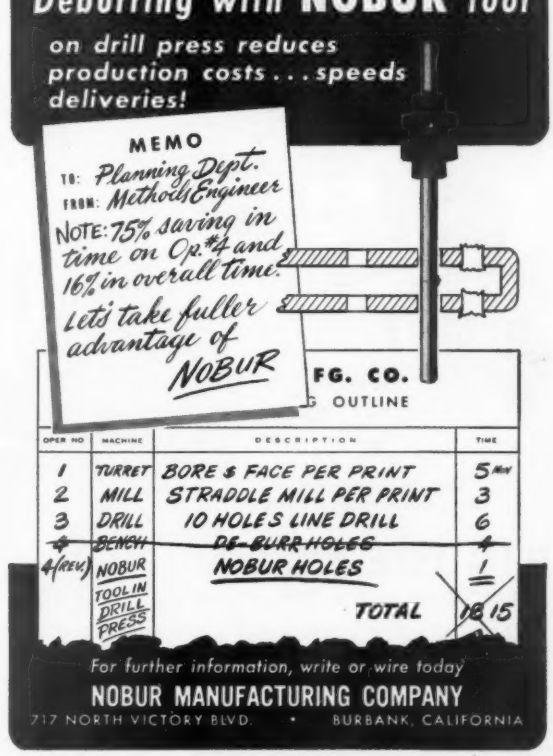
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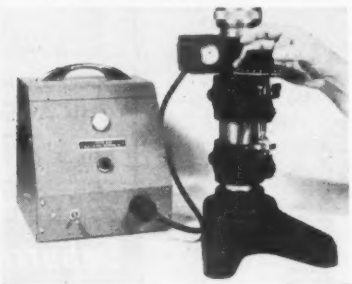
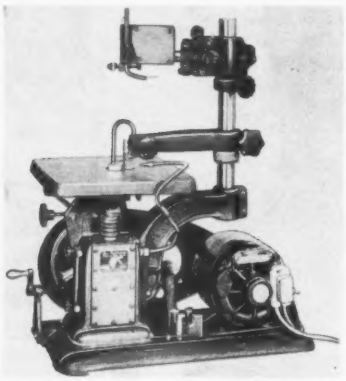
New #W Electronic Micrometer permits measurements to .00002" without any measuring pressure being exerted on the work. All measurements are direct, the instrument is not a comparator. An elec-



tronic circuit, sensitive to 5 millionths of an inch at the micrometer tip, gives visual indication at contact. **Inform-A-Gram No. A13.**

This Filing Machine by All American Tool & Mfg. Co., 8027 Lawndale, Skokie, Illinois, files, saws, and hones with equal facility and accuracy. Two overarms are featured



for greater convenience. Other desirable features include a special universal joint assuring 100% vertical file position; and dirt and chips are sealed from drive housing by a neoprene bellows.
Circle Inform-A-Gram No. A14.

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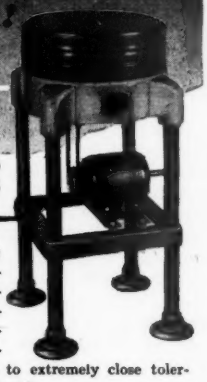

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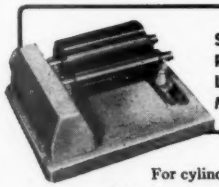

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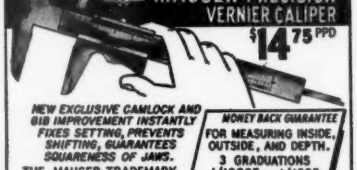

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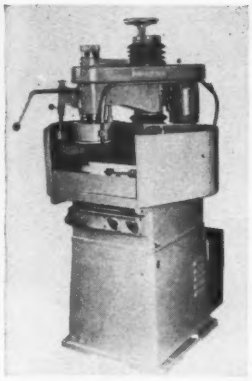
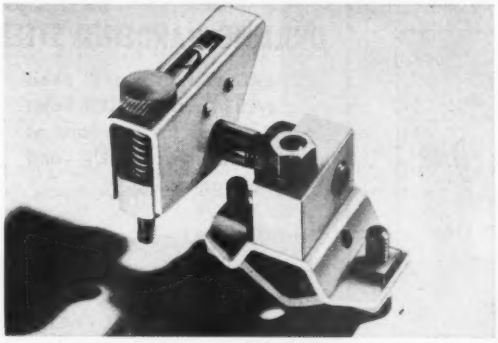


New Surface Grinder Uses Vertical Spindle and Cup Wheel. Wheel is passed rapidly over work for rough grinding, and hydraulic feed engaged for finish, giving sizable output gain over conventional methods. When equipped with a diamond wheel, the machine is ideally suited for fast roughing out of prism and lens blanks. Standard Norton cup wheels used, complete equipment for wet grinding. George Schepp Co., Inc., 200 Lafayette St., N. Y. 12. **Circle No. A15.**

Angles, Parallelism and Surface Quality of metals, plastics, or glass are quickly and precisely measured with this new "Jacknife Auto-Collimator" from Perkin-Elmer Corp., Norwalk, Conn. No special operating skill is needed, the collimator being used directly against any surface which reflects a beam of light. An important feature is the folded optical path. This permits all components of the instrument to be housed in a single rugged casting. The work table with its leveling controls is directly in front of the operator for easy manipulation while he is observing the image. **Circle Inform-A-Gram No. A16.**

Bore Depth Control to .001" is possible on any turret lathe, hand screw machine or other machine tool where stops are employed with new Depthmaster by Pekay Steel Fabricators, 865 Sangamon St., Chicago 22, Illinois. The new control can be attached to the hand wheel of any machine by operator or set-up man in less than a minute. Accurately and clearly recording the exact amount of pressure against the stop at all times, it has no moving parts to wear, and therefore has no tendency to progressive error which can develop with



more expensive spring-loaded dial indicators. Positive and substantial savings in production may be effected. The device will turn out work to tolerances often considered too critical to be held on turret lathes or drill presses in one operation, saving the entire considerable expense of secondary operations. It maintains uniformly accurate results by removing the operator "feel" factor. It cuts waste of test or check pieces, because machine adjustments are reduced to a minimum, and original set-up made much faster. Full data available from the manufacturer. **Inform-A-Gram No. A17.**

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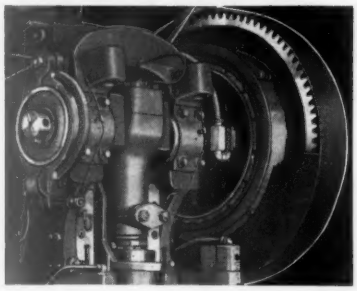

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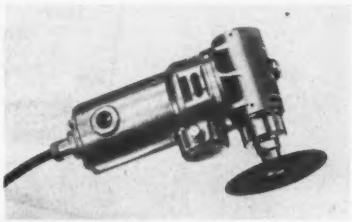
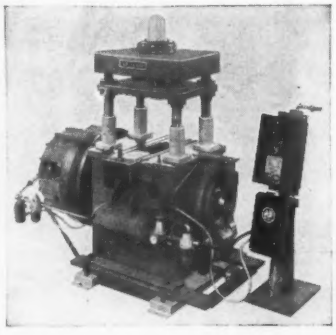
Magnetic Lifter and Feeder. From the Magnetool Div. of Multifinish Mfg. Co., Dept. 537, 2114 Monroe, Detroit 7, Michigan, this new tool is exceedingly flexible and versatile. It can be quickly adjusted to any size or shape piece, and self-aligning magnetic blocks overcome irregularities, dirt, and chips. Releases instantly with a slight twist of the wrist. **Inform-A-Gram No. A18.**

Ideal For Precision Grinding or Cutting. #B-2 Diskette, by Franklin-Balmar Corp., Woodbury, Baltimore 11, Maryland, has special cooling arrangement, no-load speed of 9000 rpm, and collet chuck integral with spindle, reducing overhang. Capacity is limited to a 4" disc. Has ample capacity to handle production work, will run for extended periods without fear of overheating. **Circle Inform-A-Gram No. A19.**



'Packaged' Air Operated Cutoff Press. This new 35 ton Ardcor press is made by American Roller Die Corp., 20500 St. Clair Ave., Cleveland 17, Ohio, features dependability and accessability. The press can be equipped with bolster plates and arranged also to operate as a continuous automatic dieing machine. A roll feed is supplied for this application. Features include low maintenance cost clutch and brake, with shoes and linings that can be changed in minutes rather than hours. Shut height adjustment is in the head of the press, with perfect alignment assured by means of a center pilot. **Circle No. A20.**



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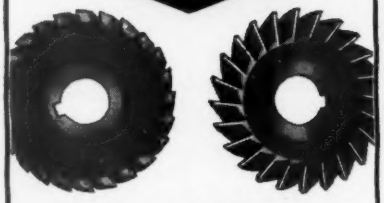
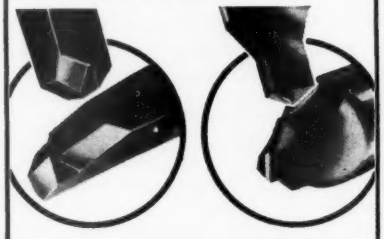


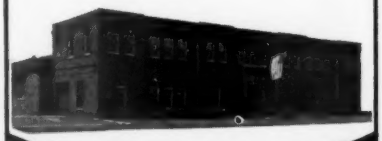
WORN and OBSOLETE CUTTERS RECLAIMED

YOUR CUTTING TOOL COSTS can be cut by converting worn and obsolete high speed and carbide cutters for other jobs. Let us help you set up a tool salvage program.



CARBIDE TOOLS FOR DRILLING HARDENED STEEL

These designs have been proved in our shop. Drill holes and centers in steel hard as 66-C fast, accurately and without annealing.



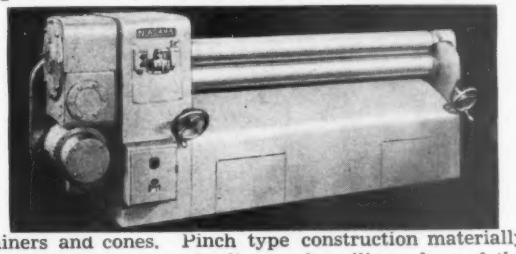
WRITE FOR OUR CATALOG

NATIONAL TOOL SALVAGE CO.

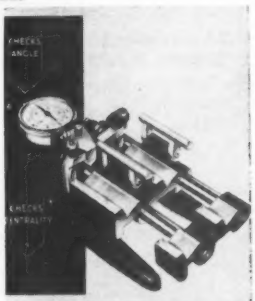
6511 EPWORTH BOULEVARD
DETROIT 10, MICHIGAN

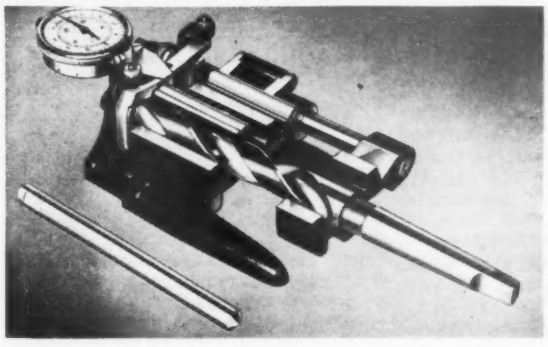
5,000lb Is Capacity of New Coil Grabs recently introduced by Dixon Automatic Tool, Incorporated, 2300-23rd. Avenue, Rockford, Ill. Two models are made, one for coils up to twelve inches wide and the other for coils to 24". Design is such that the operator can lift the coil from the pallet to a vertical position in one easy motion. Transfer of coil from the vertical to horizontal position may be equally readily accomplished. Safety lock incorporated. **Circle No. A21.**

New Series of Bending Rolls by Niagara Machine & Tool Wks., 637-697 Northland Ave., Buffalo 11, N. Y., will produce commercially true cylinders from the thinnest sheets to maximum capacity, and, in addition, can roll a multitude of bends in various shapes including oval forms, rectangular pipes, rounded end containers and cones. Pinch type construction materially reduces flat spots on leading and trailing edges of the work. As all three rolls are power driven, light gage sheets can be readily formed into small diameters. Power adjustment for the rear roll permits effortless positioning for any desired curvature radius. **Circle Inform-A-Gram No. A22.**



This "Matrix" Drill Point Measuring Instrument quickly and accurately checks the correct drill point angle and its centrality. Two vees support the straight or tapered shank drill. On a common indicator dial, centrality is read directly to .001" and angle to one degree. This portable unit will ensure correct hole size and optimum drill life. Setting standards are supplied for standard drill point angles. Engis Equipment Company, 431 South Dearborn Street, Chicago 5, Illinois. **Circle Inform-A-Gram No. A23.**





NEW many purpose individual Vulcanaire

DUST COLLECTING UNITS

Use on surface and other grinders where *any kind* of grinding dust must be removed. Salvage diamond dust.

Inexpensive, compact units, with no moving parts.

Operated from your present air supply.

Installed in a few minutes, eliminating need for costly centrally located dust collecting systems.

The collector element is mounted on the side of the machine. Quickly cleaned, requiring no refills.

Vac-suction pick-up device (vacuum nozzle) is mounted on the grinding wheel guard or close to grinding wheel on other applications. *This mounting permits constant contact with dust as the wheel is moved up or down.*

A simple needle valve operates the unit, and can be shut off when machine is not in use.

Available in two sizes: 700 series for grinding wheels 7" dia. or less—200 series for wheels 2" dia. or less.

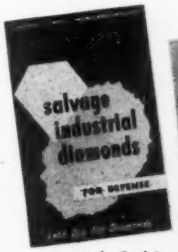
"SALVAGE INDUSTRIAL DIAMONDS FOR DEFENSE"*

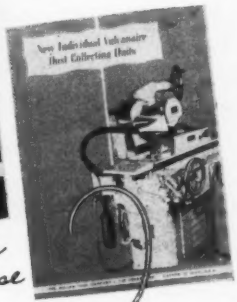
*That is the title of the National Production Authority's booklet which describes the growing critical shortage of industrial diamond supplies.

The shortage will soon result in idle machine tools, and lost defense production unless we straightway begin to conserve grinding wheels and salvage diamond dust. The N.P.A. fully and helpfully explains the methods for doing these things.

Request this N.P.A. booklet on your letterhead and Vulcan will be glad to send it to you. You will also receive literature on the versatile Vulcanaire Dust Collector which promotes health in your plant and turns dust into money.

It's made by the makers of Vulcanaire
The jig grinding attachment





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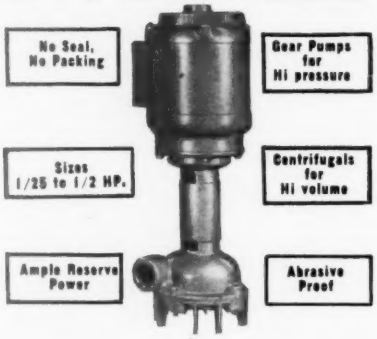

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ENGRAVING, ACID ETCHING, ELECTRIC MARKING—

all can be done in this PREIS-PANTO UE MACHINE with simple attachments.

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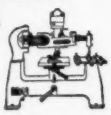
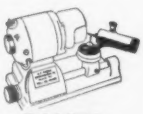
MODEL UE ENGRAVER
For metals, plastics and other materials. Electric marks or acid etches hardened steel.





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CUTTERS and COLLETS
Single lip, straight or tapered.

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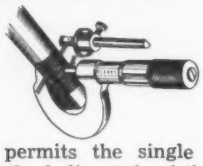
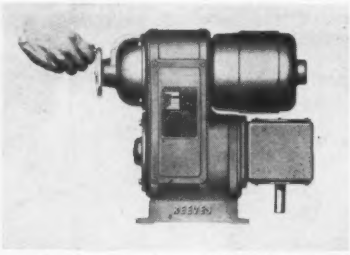
H. P. PREIS ENGRAVING MACHINE CO.
647 U. S. Route 22, Hillside, N. J.

New Thread Wire Holder simplifies 3-wire method of measuring pitch diameter. By Scully Machine Co., 62 Walter St., Bridgeport, Conn. The side-wise flexibility of the coil



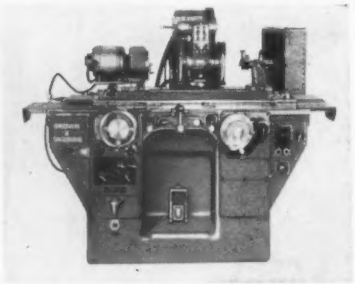
spring permits the single wire to assume the helix angle of the thread being measured, while measuring pressure of micrometer expands the spring to permit the single wire to assume parallelism with the two wires. **Inform-A-Gram No. A24.**

Fractional HP Vari-Speed Moto-Drive combines in one space-saving unit any standard NEMA frame, type "C" face-mounted motor; speed



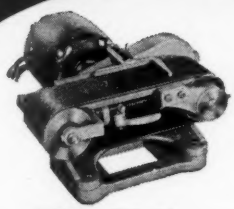
varying mechanism with ratios from 2:1 through 10:1; and new right angle worm gear reducer. Right angle drive saves space by making possible mounting flat against the driven machine. From Reeves Pulley Co., Columbus, Indiana. Bulletin M-522. **Inform-A-Gram No. A25.**

New No. 1 Universal Grinding Machine by Brown & Sharpe Mfg. Co., Providence 1, R. I., features increased flexibility to conform with the production requirements of today. A selection from the many desirable features includes: unit type wheel spindle with antifriction bearings and sealed lubrication; inde-



pendently driven, instantly available internal grinding spindle furnished as standard equipment; hydraulic table drive with infinitely variable speeds from 3″ to 150″ per minute; variable speed head-stock drive—60 to 600 rpm, and universal turret providing 4″ adjustment of wheel spindle head at right angles or parallel to wheel slide.
Circle Inform-A-Gram No. A26.

DOES IT BETTER
DOES IT FASTER



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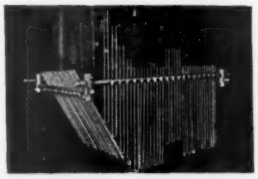

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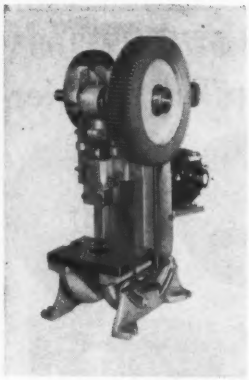
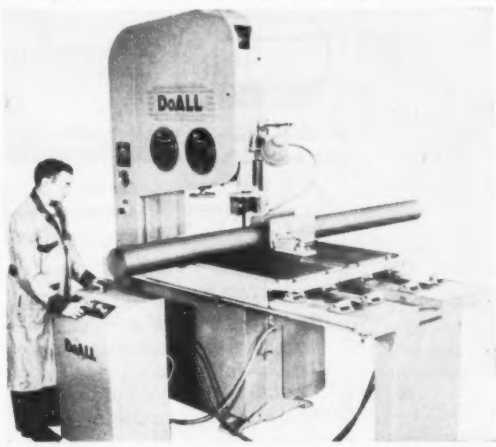


New Back-Geared Benchmasters. Especially designed for drawing, forming, and operations requiring slow powerful strokes, the new Benchmasters are equipped with husky, stub-tooth back gears, reducing speed range from 40 to 100 strikes per minute. Ram strokes may be individually triggered or continuous. 4 ton standard, 4 ton deep throat and 7½ ton models now available. From Benchmaster Mfg. Co., 1835 W. Rosencrans Ave., Gardena, California. **Inform-A-Gram No. A27.**

The Ernst Metal Hardness Tester makes possible readings anywhere in the plant, is available in Rockwell "A", "B", "C", "15N" scales and Brinell low and medium scales from Newage International Inc., 235 E.

42nd St., New York 17, N. Y. Direct reading and individual calibration of each instrument assures accuracy, simple operation gives speed. Ideal for testing small parts and finished pieces. **Circle No. A28.**

Band Sawing Machine For Heavy-Duty Cut-Off. By the DoAll Co., Des Plaines, Ill., this machine has large capacity, wide speed range, is designed principally for rapid heavy-duty cut-off. The saw blade is twisted 90° at the work table so that work may be fed from the



front and is not limited in length by throat capacity. Speed 40-10,000fpm. Table and blade readily reset in normal position for conventional low or high speed, friction, straight, or contour sawing. Table hydraulically powered. **Circle Inform-A-Gram No. A29.**

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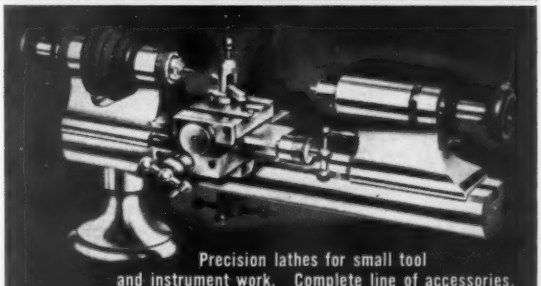
ACE ABRASIVE LABORATORIES | 250 WEST 57th STREET NEW YORK 19, N. Y.

Collet capacity 3/16" or 5/16", swing 4", bed 18" long, 6 position self-indexing turret with ½" holes.

Immediate delivery of lathes and tools.

LEVIN® Jewelers type lathes for fine instrument work and second operations. Collets as small as .004". Send for catalog. Louis Levin & Son, Inc., 782 E. Pico Blvd., Los Angeles 21.



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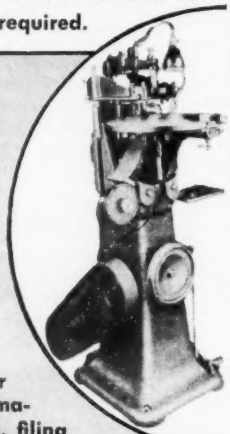
Speedy and Accurate They Effect Savings in Time and Costs Up to 60% . . . yet they're so simple to operate skilled labor is not required.



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OLIVER DIE MAKERS Available in 5 Models

The Bench Model S-1 (illustrated) is a single speed die maker for use on tool steel up to 1" thick.

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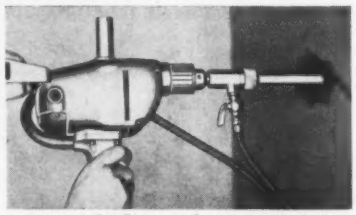
1436 E. MAUMEE · ADRIAN, MICHIGAN

This New Water Swivel permits diamond drills to be used on a great variety of jobs in construction, installation, and building maintenance work. It can be mounted in a ½" chuck on any standard drill, and will take any size diamond drill from ¼" to ½" dia.

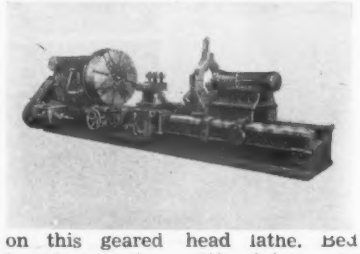


Circle Inform-A-Gram No. A30.

Non-Warping, Non-Rusting Granite Surface Plates by Lawley Granite Surface Plate Co., 1412 Packard Bldg., Philadelphia 2, Pa., are made from a very dense, extremely hard and uniform grained black granite, and have a surface accuracy of .00005". These plates are stable under temperature changes and shock; are abrasion and impact resistant; will not develop burrs or humps, and have smooth non-glare finish.

Circle Inform-A-Gram No. A31.

Simmons Redesigns Heavy Lathe. Extra heavy 48" engine lathe has been redesigned for more power and rigidity and is now particularly well suited for ordnance plants, shipyards, and other shops having heavy turning, facing, and threading operations. Roll turning, shell bodies, and tail shafts are examples of the heavy work that can be done on this geared head lathe. Bed lengths run from 20' minimum to any length required by 5' increments. Bed width is now 46½" and there is a continuous flange along the bottom for increased rigidity. The lathe is also built in 54" and 60" swing and can be modified to meet special requirements. Standard equipment includes thread cutting mechanism, compound rest with power cross, etc. Simmons Machine Tool Corporation, Albany 1, New York.



Circle Inform-A-Gram No. A32.

The Model 1100 Hybco Tap Grinder

• Capacities No. 0 Mach. Screw to 1½" Hand Taps.

Representatives in Principal Cities

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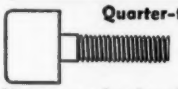
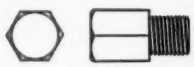


Quarter-turn Screws, assorted sizes.

T-Nuts, case-hardened for all standard T-slots.

Coupling Nuts, case-hardened.

Studs — also T-slot bolts.



Jig feet or rest buttons — hexagon and circular.

Also hand wheels, machine handles, levers, cranks, fixture units, magnetic parallels, machine vises, cast iron knobs. Write for catalog and prices on complete REID line.

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KEYWAY CUTTING
WITH
GLENNY Adjustable push **BROACHES**

STRAIGHT
ACCURATE
KEYWAYS

NO
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★ Reduce Costs.
★ Eliminate Blade Breakage.
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Fast, Accurate Measurements
With the **AMIC** "Quick-Action"
Vernier Caliper

AT NEW LOW PRICES

The perfect tool for machine shop, tool room inspection and Quality Control. A flick of the thumb and you've got your external and internal dimensions. Knife-edged hardened jaws provide exact thread measurements. A depth gage blade gives speedy measurements. AMIC designed and made exclusively for AMIC by an outstanding European manufacturer. Scientifically engineered, painstakingly machined, packed in a sturdy leatherette case. A tool without rival.
Size 6" No. 21B, Graduation 1/40", vernier reading .001.
No. 22B, Graduation 1/40" and full MM, vernier reading .001 and 1/10 MM.
Write for Circular A. Dealers inquiries invited.

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AMIC BUILDING
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DON'T SCRAP IT!

Ever have a tap or drill break in an expensive part? . . . so that even careful drilling couldn't save it? Today, parts costing as little as 50c can be economically salvaged by an Elox Electron Drill.* They're real money savers! No plant can afford to be without one. Write for particulars.

ELOX CORPORATION
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734 N. Rochester Rd.
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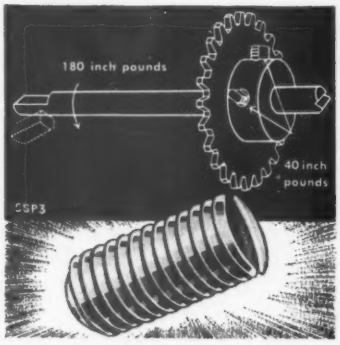
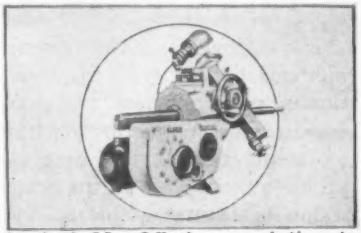
Increased Holding Power is built into the "Nu-Cup" set screw by Set Screw & Mfg. Co., 158 Main St.,



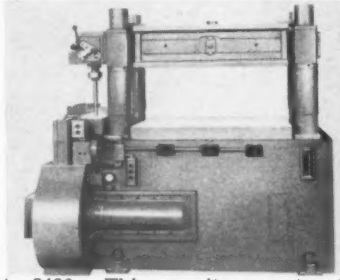
Bartlett, Ill. Pressure distribution area 20-25% increased. Illustration diagrams test showing how a gear shaft broke under 180 inch-pounds, while gear remained firm, locked to shaft by two Nu-Cups.
Circle Inform-A-Gram No. A33.

Unusual Time & Cost Savings may be made with this #B-23 portable lathe by Barrett Equipment Co., Industrial Div., 2101 Cass Ave., St.



Louis 6, Mo. Offering a solution to difficult and intricate machining problems, the lathe is self contained and semi-automatic after simple initial set-up. Lathe head and cutter revolve around the boring bag.
Circle Inform-A-Gram No. A34.

New 100 Ton Die Tryout Press by Alpha Tool Wks., 9281 Freeland Ave., Detroit 28, Michigan, has many new features. Floor and over head space are small. Head can be quickly released and rotated to any point



to 240°. This permits operator to barber, spot, shear, fit and finish both punch and die without removal from press. Four post construction assures perfect alignment of punch and die, and press has a 6" stroke, operating at 50 strokes a minute.
Circle Inform-A-Gram No. A35.

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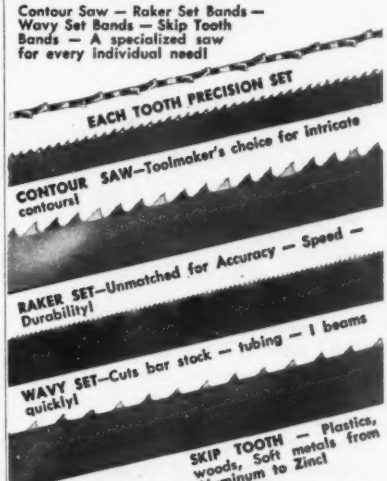
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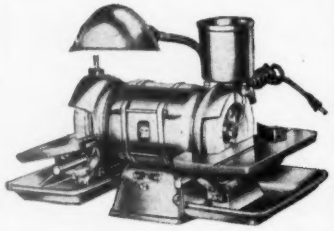

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4369 Duncan Ave. St. Louis 10, Mo.

. . . Carbides, from page 65

imizing the energy required to cut the work and provides better finishes in many instances, but such factors as decreased tool life, ineffective chip disposal, work distortion, etc. make it somewhat unreliable in its present state of development. Electro-erosive[19] or electro-spalling methods of cutting have also been developed, which seem to show promise, but again lack the ability to remove great quantities of metal in short periods of time. Their principal application has been in cemented carbide cutting tool grinding, boring and forming chip breakers. Another method of metal removal takes advantage of failure by abrasive wear by the application of ultrasonic frequency[20] to a tool which is directed into the work while riding on a film of abrasive powder.

The novel metal-removal methods of the type just mentioned, more efficient tool cooling, improvements in machine tools and cutting tool design—all have their place in the orientation of future industrial tool developments. Up to the present time, however, the cemented carbides have resisted all efforts at substitution.

It is unfortunate, in spite of their extensive use, that so little has been published on the fundamental physical metallurgy of these interesting and unusual systems. Because of the great success of the extant carbide compositions, little has been done to find suitable binders for the cheaper and often more stable oxides, borides, nitrides, etc. As our industrial machinery and transportation engines run faster, hotter, and often under the severest conditions of stress and corrosion, the need for more and better materials to withstand these effects becomes more important.

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Simplified Interchangeable Punching Unit

A new design feature for hole punching units provides a positive die retainer and a simplified method for interchangeable die removal.

This new development permits the interchangeable dies to slip-fit in the holders and to be

Photos courtesy Wales-Strippit Corp.

Fig. 1. Illustrating removal of the threaded pilot pin which releases the slip-fit interchangeable die from the holders.

fastened into position by a threaded pilot pin. The threaded pilot pin is tightened or removed with a hex wrench.

Each hole punching unit consists of a holder that carries the punch, die and stripping mechanism. This independent, self-contained design eliminates the necessity of attaching punch to press ram and assures permanent alignment of punch and die. With these units, dies may be made and put into operation long before a "custom-made" die. In fact, it is often possible

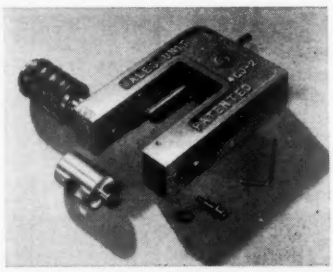

Fig. 2. Showing threaded pilot pin and die removed from the hole punching unit.

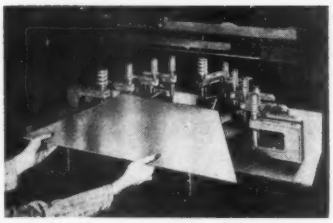

Fig. 3. Same group of units mounted on a template in a stamping press.

to put a die in operation the same day a part is released for production. By reducing perforating die making to such a simple assembly job, any good mechanic can assemble these units into a hole punching die for operating in stamping presses or press brakes. High-cost die-setting time is eliminated.

Set-ups are made on T-slotted plates or templates for stamping presses and on T-slotted plates, rails or strip templates in press brakes.

By simply placing the set-up on the press bed it is ready to

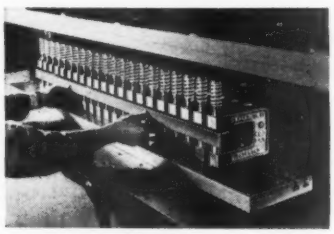

Fig. 4. Showing a set-up of hole punching units mounted on a "strip" template in press brake.

start punching with the first stroke of the press without adjusting the units, punches or dies. Due to the uniform shut height of the hole punching units, the press ram only requires one adjustment regardless of the number of hole punching patterns placed in operation. These features reduce press "downtime" between set-ups to a matter of few minutes.

These hole punching units are available in 3 holder widths with maximum punch diameter of ¾" for use with metal up to ¼" thick. Pedestal-type die permits punching holes in angles as well as sheets.

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- Mills straight and spiral flutes
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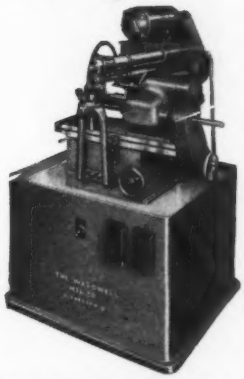

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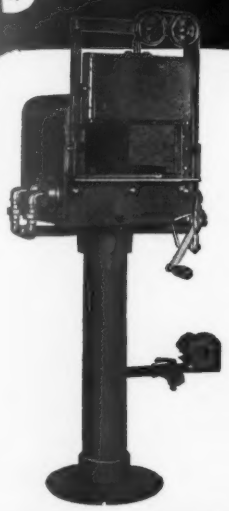

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. . . High Speeds, from page 49

Cutting Speed Vs. Tool Life

It has long been known that the general relationship between cutting speed (V) and tool life (T), over the range of speed conventionally used, may be represented by the equation VT^n = Constant. When plotted on log-log paper this relationship appears as a straight line, as indicated in Figure 1.

In recent years, however, the question has often been raised as to whether the direction of this curve might perhaps be reversed at exceedingly high values of cutting speed; in other words, whether there really is a "Valley of Death" (for a given set of operating conditions) beyond which tool life would again increase if the cutting speed were increased. As a part of our continuing research in this field, several investigations have been made to explore the region of very high speeds, on various types of steel and on cast iron. Thus far, up to a speed of about 14,000 feet/min. on all these materials, no such Valley of Death has been discovered.

Thus it appears that if operating conditions are normal, and **are maintained exactly constant,** the tool life will always decrease when the cutting speed is increased, even up to values far beyond those now commercially usable.

From the foregoing it will be evident that the effective attainment of high cutting speed is not brought about by making an arbitrary increase, but by first improving all operating conditions as much as possible, then increasing the speed to the optimum value so as to obtain a minimum cost per piece. As shown, the optimum cutting speed for any operation may be readily determined by making a few tests and applying simple arithmetic.

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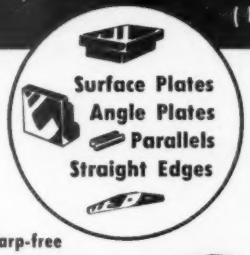

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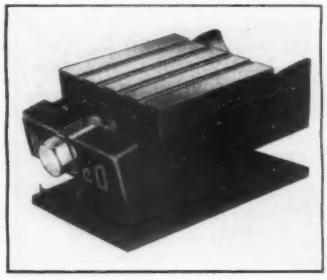

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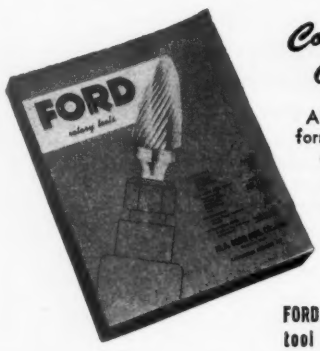

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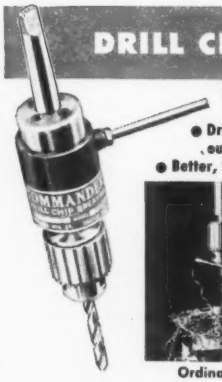

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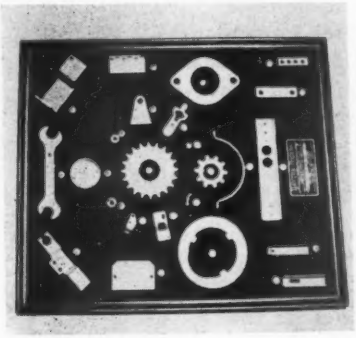
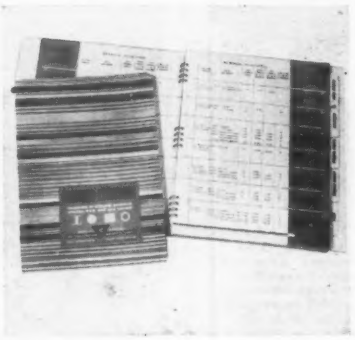
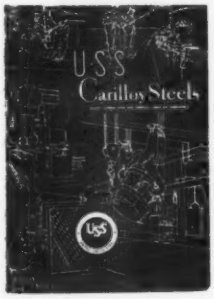
"Corrected Tool Diameter Tables" is a time and trouble saving manual now available from Aluminum Co. of America, Alcoa Bldg., Pitts. 19, Pa. Beginning of the 64 page manual explains the trigonometrical formulae for calculating corrected diameters for circular form tools and flat form tools without top rake and with 5° and 10° top rake. In each case the calculations are completely broken down. Examples are then given on using the tables which follow. Special attention is given to the Brown & Sharpe screw machine series, though the tables are applicable to all machines, including automatics.
Circle Inform-A-Gram No. C1.



Instructive To Methods Engineers in the design and construction of tools and dies where stamped products are required, these display boards are now available from Dayton Rogers Mfg. Co., Minneapolis 7, Minn. They show the basic designs of different types of stampings. Each die-cut part is tabulated with a cross index, showing the complete specifications including overall tolerances, material specification and functional application. In strip steel, sheet steel, brass, aluminum, copper, bakelite, zinc, and lead.
Circle Inform-A-Gram No. C2.

Aid in Extrusion Selection was the design object of this new 98 page brochure from Precision Extrusion, Bensenville, Ill. Covers over 4000 standard aluminum shapes, is valuable to designers, engineers, and purchasing men. Discussion of the physical properties and recommended applications of the 14 most often used alloys is included, together with basic engineering and design data, and purchasing and shipping information. Complete alphabetical index, die cut tabs for major divisions, and index listings make the brochure very easy to use.
Circle Inform-A-Gram No. C3.





Applications, Physical Properties and Treatment of "Carilloy" steels are discussed in the booklet "U.S.S. Carilloy Steels" from United States Steel, 525 William Penn Place, Pitts. 30, Pa. Fully illustrated by microphotographs, line drawings, graphs and charts are all and more of the following points: effects of alloying on the microstructure and properties of steel: hardenability: practical heat treatment; principal applications of constructional alloy steels. There are also 26 pages of tables and useful general information. In all the book contains 176 pages, constitutes a reference of lasting value.
Circle Inform-A-Gram No. C4.

Problem Attack Chart simplifies solution of parts design problems. Now available from Drop Forging Association, 605 Hanna Bldg., Cleveland 15, O., this chart shows how closed die forgings can reduce costs, improve appearance, reduce weight, and cut maintenance.
Circle Inform-A-Gram No. C5.

New Manual of Design & Welding Engineering from Eutectic Welding Alloys Corp., 40-40 172nd St., Flushing, N. Y., has information on practically every aspect of the welding process, from materials selection thru inspection.
Circle Inform-A-Gram No. C6.

"Guide To Steel Selection" is title of new 4 page bulletin condensing the characteristics, mechanical properties and uses of a comprehensive list of hot rolled and cold finished carbon and alloy steel bars. Joseph T. Ryerson & Son, Inc., Box 8000-A Chicago 80, Ill.
Circle Inform-A-Gram No. C7.

Aluminum Forming Exhaustively Discussed in new handbook from Reynolds Metals Co., 2500 S. 3rd St., Louisville 1, Kentucky. 150 pages, complete thru metallurgy to end product. Cross indexed.
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Wealth of Tapping Information is packed into the new 56 page pocket size manual just released by Threadwell Tap & Die Co., Greenfield, Mass. The answer to just about any question. Invaluable to machinists, purchasing agents, apprentices and engineers alike.
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Special Applications Demanding Determination of Attained Temperature are discussed in a bulletin from Tempil Corp., N. Y. 10, N. Y.
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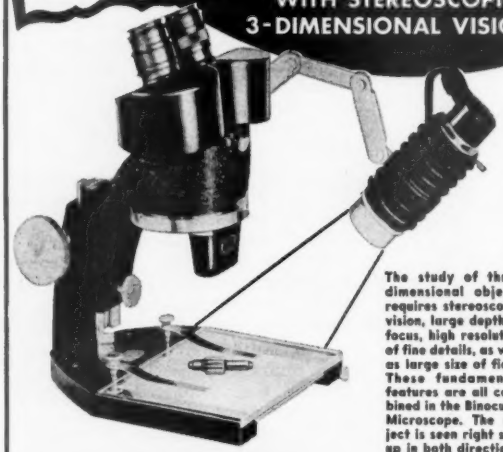

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. . . Modern Presses, from page 68

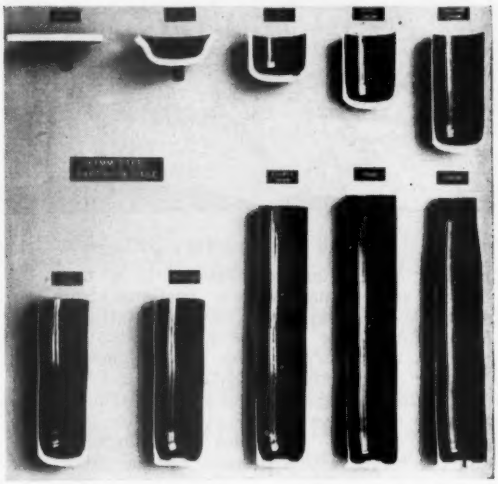

Fig. 3. Sequence of press operations required in manufacture of 90-mm steel cartridge cases.

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. . . *Continued on page 144*

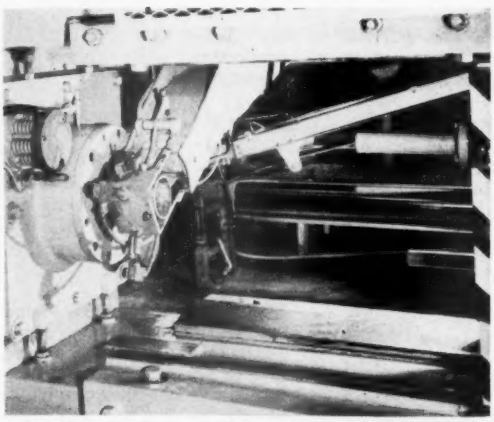

Fig. 4. On the second draw, the feed chute aligns the parts in a position to receive the punch. When the part is properly aligned, a limit switch is engaged that actuates the punch. The case is pushed through the die, while pneumatically operated pawls hold the next part in the chute until the punch has returned to starting position. The press is fully automatic as long as work is available in the feeding chute.

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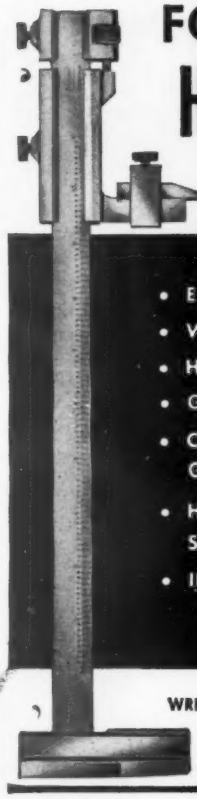

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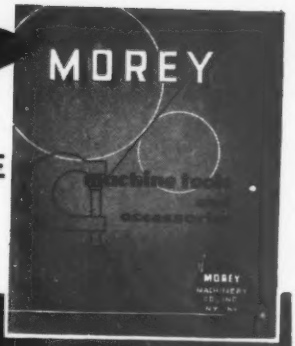

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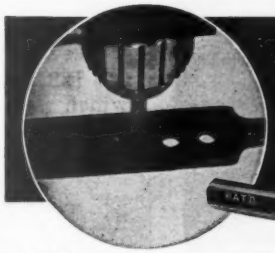

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Carbide Tooling Increases Tool Life on Severe Interrupted Cuts

Increased tool life up to 1150 per cent is enabling many operators to show reduced machining costs in instances of severe interrupted cutting. An agricultural equipment producer overcame such a cutting problem in rough turning his cast iron corn-husker rolls with clamped-on-tip cemented tungsten carbide tools on a 10-horsepower lathe. These rolls contain many hard spots and sandy inclusions have numerous grooves on their long slender bodies which present unusually severe interrupted cutting conditions.

Terrific pounding set up by these interruptions causes the 3¾-inch diameter by 64-inch long rolls to vibrate and bounce to such a degree that the cross-slide feed handle has to be fastened down with a "C" clamp to prevent creepage. A roller steady-rest was attached to the cross-slide to support the workpiece. However, this helped very little since it bounced along with the cross-slide at each interruption.

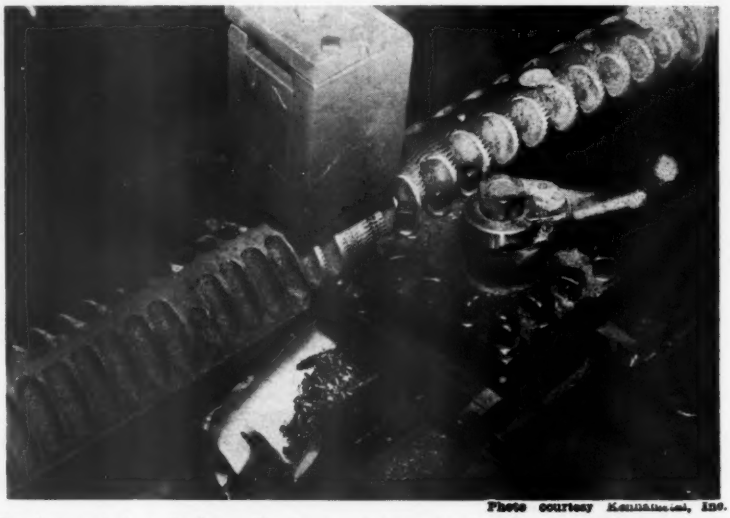

Photo courtesy Kennametal, Inc.

Turning cast iron husker rolls (severe interruptions) with clamped-on-tip tools, having 15° negative BR, 30° SCEA, and 8° ECEA. Previously-used HSS tool averaged only 3 pieces per regrind. Carbide tools averaged 350 pieces per regrind.

Initially this operation was run with high speed steel tools which required regrinding after turning only 3 pieces. In an attempt to reduce frequent tool changes and increase production, cemented tungsten-carbide tools were applied to the job. Despite the severe operating conditions, the tools turned 350 pieces before any regrinding was required, representing 115 times greater tool life.

First tool tried on the job was a standard brazed-on-tip type. To prevent breakage occasioned by the severe interruptions it was found necessary to modify the tools as follows: Increase back rake to 15 degrees negative, change the end-cutting-edge angle to 30 degrees, and increase the nose radius to 1/16". This tool averaged about 350 pieces per grind. What little breakage resulted was due to inherent brazing strains aggravated by the severe interruptions.

To correct this condition, a clamped-on-tip tool with similar modification was applied. With its thermal-strain-free assembly, it eliminated breakage and continued to produce 350 pieces per grind. This extended life reduced tool grinding by approximately 99 per cent.

After changing to cemented tungsten carbide tools, revolutions and surface feet per minute were doubled to 80 and 78.5, respectively. Feed was increased from 0.030 to 0.044-inch with depth of cut remaining the same at ⅛ to ¼-inch. Turning time per piece was reduced from 39 to 15 minutes and 16 pieces produced per 8-hour shift as compared to 11 for the high-speed steel tooling set up.

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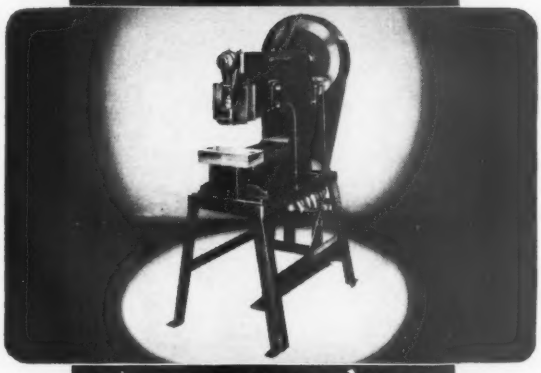

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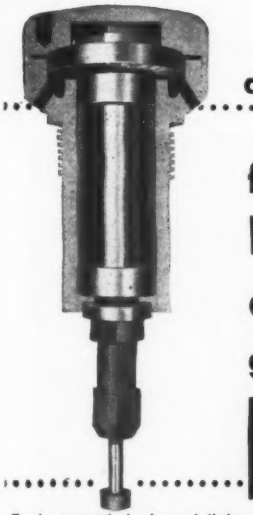

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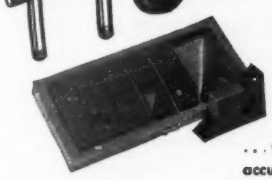

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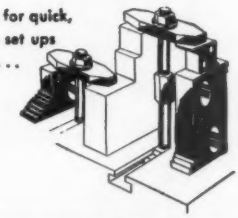

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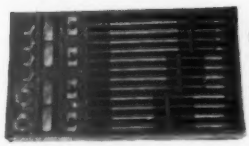

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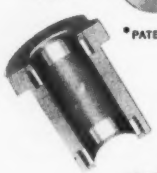

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. . . Modern Presses, from page 140

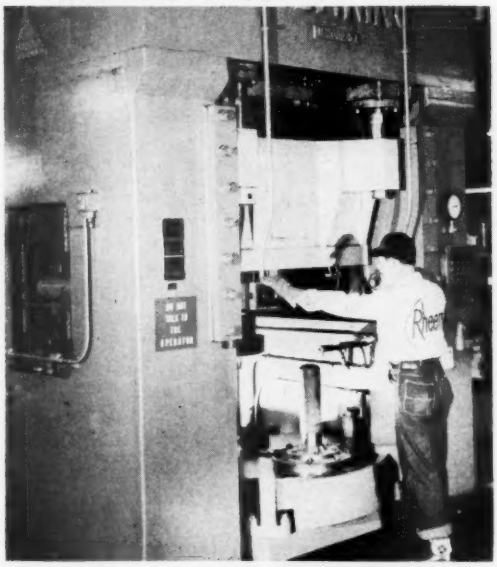

Fig. 5. The press for pre-heading has a hydraulically driven dial. When the operator has fully positioned the workpiece on the post, the dial automatically indexes 180° to position the workpiece under the die.

reduces the wall thickness by approximately 44%. About 265 tons pressure are required. On the opposite end of the same press, parts go through the first draw operation, reducing the wall thickness another 45%. Double End presses perform three more draws and a tapering operation to bring the case to its finished shape. The fourth draw takes about 4.5 tons pressure, reducing the area by 2.4%, and wall thickness by 37.5%.

. . . *Continued on page 148*

Fig. 6. As the dial rotates, the case must strike the bottom finger switch for the press to stroke. If contact is made with the upper finger switch, the press will not stroke. Improperly positioned cases will thus present no real hazard.

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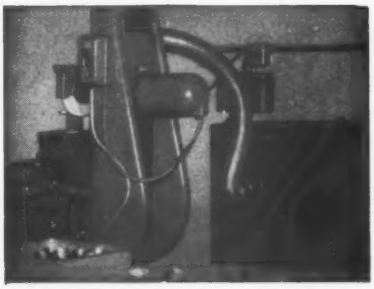

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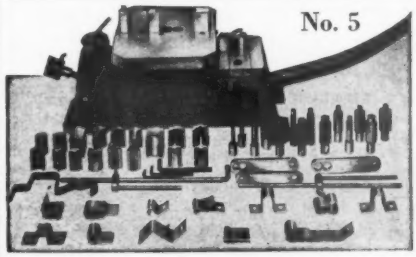

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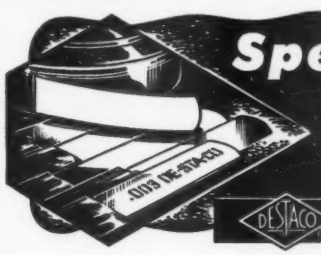

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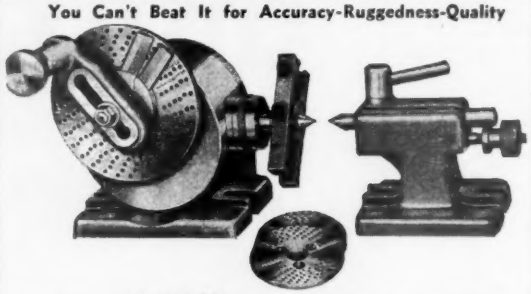

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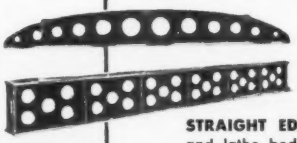

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SCHUPACK SAVINGS

Details and prices on a range of supplies from rotary cutters and burs to safety goggles and hand grinders now available from Schupack Supply Company. This is a new revised catalog for 1953, contains details of hundreds of items.
Circle Inform-A-Gram No. E1.

CARBIDE & H.S.S.

Comprehensive tool bit selection is offered by this new brochure from Whitman & Barnes. The carbide section includes grades for steel and for cast iron and non-ferrous metals; H.H.S. in square, rectangular and standard cut-off.
Circle Inform-A-Gram No. E2.

OIL PURIFICATION

Reducing downtime and waste and bettering performance on your hydraulic machines are but three of the advantages to be gained with Honan-Crane equipment. This bulletin is new, contains actual field economies and savings.
Circle Inform-A-Gram No. E3.

RIVETING IN 1953

Latest catalog from Hi-Shear Rivet Tool Company has valuable information on the latest equipment in rivets and riveting supplies. Many new tools and a deal of technical information added Standard in the aircraft industry.
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FUNCTIONAL FASTENERS

Speed, permanence, and diversity are built into the line of industrial fasteners pictured and described in this unique brochure by Simmons Fastener Corporation. You'll find a fastener here for that application that has been hampering production.
Circle Inform-A-Gram No. E5.

ALL END MILLS

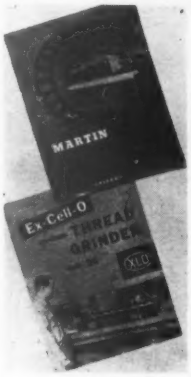
New from the Arrow Tool & Reamer Company, this catalog gives a rapid picture of just what is available in high speed steel end mills. Tabular/photographical reference.
Circle Inform-A-Gram No. E6.

FLAT AND SQUARE

New Bridge surface grinder bulletin tells how flat and square surfaces can be generated inexpensively and by the hand of unskilled labor. Automatic accuracy is built into this machine.
Circle Inform-A-Gram No. E7.

GAGES & CONTROLS

Pratt & Whitney bulletin on continuous gages and control units has 27 very interesting pages, with fully illustrated application data on 16 different type units, giving dependable and accurate gaging without interfering with your production.
Circle Inform-A-Gram No. E8.



CONTRACT ACCURACY

This new bulletin gives you an inside look at the plant of Martin Grinding & Machine Wks., specialists in superfinishing, jig boring, internal and external grinding and honing. Complete toolroom facilities are here and ready for you.
Circle Inform-A-Gram No. E9.

FLEXIBLE THREAD GRINDING

New machine, new bulletin. The style 36 precision thread grinder by Ex-Cell-O Corp. incorporates unusual flexibility. This bulletin contains complete data.
Circle Inform-A-Gram No. E10.

AUTOMATIC QUALITY

Modern quality control methods in the fabrication of Titan brass and bronze rods, forgings, die castings, welding rods and wire are discussed in this new brochure. The "Quantometer," a direct reading spectrometer, gives analysis.
Circle Inform-A-Gram No. E11.

800 CARBIDE TOOLS

48 pages of carbide tool information are given in this new bulletin from Nelco Tool Co. Colorful and comprehensive, it's designed as a ready reference for tool engineers, designers, production supervisors and purchasing agents. Don't miss.
Circle Inform-A-Gram No. E12.

MILLING CUTTERS

72 pages of solid information on inserted blade milling and boring cutters, including new material on carbide milling of steel, tool selection, cutting methods and grinds are contained in new catalog 60H from Ingersoll Milling Machine Co.
Circle Inform-A-Gram No. E13.

1000% MORE TOOL LIFE

This new booklet—A Final Step in Tool Sharpening—has case history data on obtaining better and more consistent finishes and more pieces per grind. Methods analysis given, explains the how and why of more and cheaper production.
Circle Inform-A-Gram No. E14.

KING SIZE SELECTION

This new catalog includes handy technical reference charts and data, contains perhaps the largest standard selection of drill jig bushings yet made available. Clearly printed and organized for convenience. American Drill Bushing Co.
Circle Inform-A-Gram No. E15.

MEASUREMENT SPECIALS

From Foster Supplies Co., this latest catalog contains all data on a comprehensive line of micrometers, vernier calipers, height gages and dial indicators. Each separate item is accorded full treatment, with photographs and specifications.
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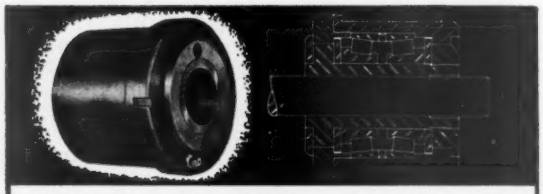

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* Protects against thrust loads as well as radial
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* Can be furnished with shafts to use as pressure rolls

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. . . Modern Presses, from page 144

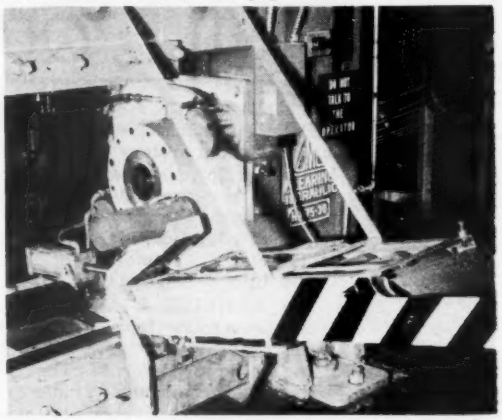

Fig. 7. On the fourth draw, the cases are loaded into a chute but this time are lifted into position by pneumatic pawls instead of sliding down in front of the dies. This reduces the length of the press stroke.

The base of the cartridge case is formed in two operations, on twin 2,000-ton Clearing hydraulic presses of conventional vertical design. Pre-heading is done between third and fourth draws and requires 1350 tons. Heading is performed between the fourth draw and the tapering operation. For both operations, the presses are each equipped with two-station dial-type tables that index 180° allowing the operator to load the drawn part on the heading post at the front of the press. Interlocked with the press stroke, the table automatically moves the post and its workpiece into position under the heading dies. Limit switches ensure that the case is properly positioned on the heading post before the press will operate.

The manufacturing picture at Rheem's New Orleans plant is that of a balanced operation. Each press is an integrated unit of the entire coordinated effort.

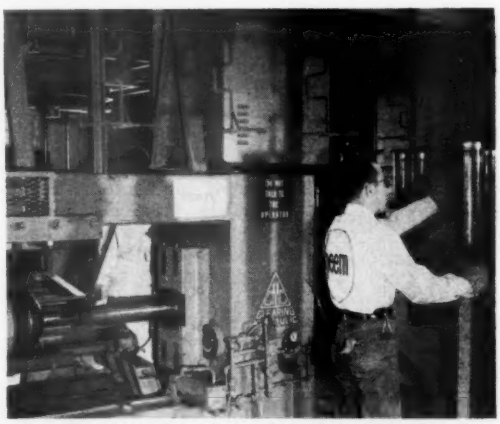

Fig. 8. A nearly completed case is shown here in the tapering dies. The unloading platform has been temporarily removed. Tapering requires 90 tons. As the punch retracts, the 25-ton hydraulic ejector built into the slide is activated and the piece is removed from the post.

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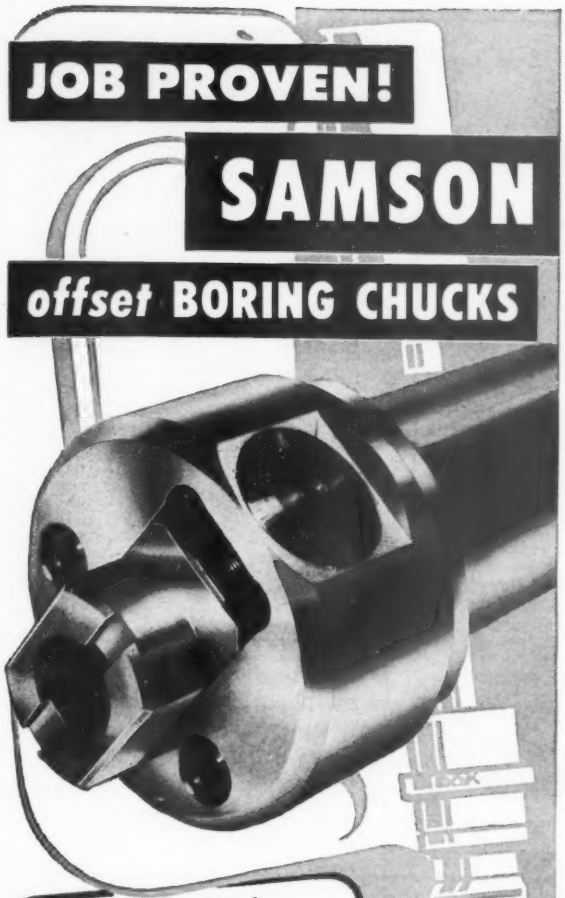
SAMSON

offset BORING CHUCKS



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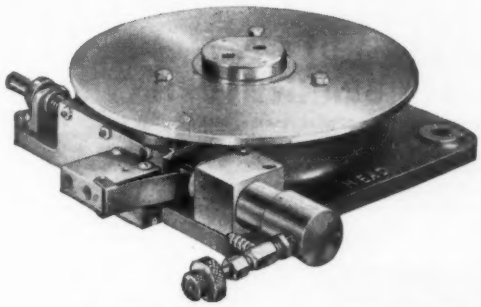

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Present an absolute continuous bearing surface, finished up to 50 millionths inch. Incredibly smooth. Falling objects do not cause humps. Being harder than hardened steel, can take greatest mistreatment without causing inaccuracy of surface. No oiling. Will not rust or warp. No re-scraping. Most durable.

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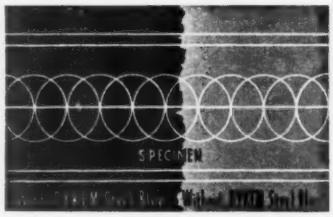

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- Patented Positive Punch and Die Alignment

The Leslie Model A Press is the low cost solution to your short run blanking problems.

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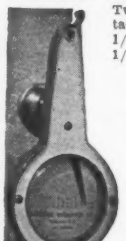

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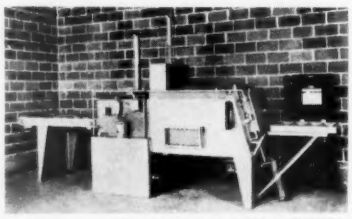
Feature Issue

Draw-Quench Unit

A new, combination draw-quench metal treating unit, designed for both bright, scale-free tempering and controlled oxidation tempering from 400° to 1400°, is a fully automatic, sealed unit. The heating chamber is separated from the combination cooling chamber and quench tank by a sealed door.



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Controlled endothermic atmosphere is provided in both heating and cooling chambers. Parts being treated do not contact air at any time during tempering, and work that has been previously bright hardened remains clean and scale-free, eliminating blasting or pickling operations.

Greater processing efficiency is obtained by combining draw and quench in a single unit, making possible immediate transfer of heated work into quench or cooling zone without furnace cooling or work handling delays. After completion of the heating cycle, the intermediate door opens automatically and chain-driven rods move into the heat zone, contact the load with cam actuated arms, and transfer the trays to the quench rack. The intermediate door reseals automatically, allowing another work tray to be loaded into the heat zone.

Tempering and cooling or quench is performed in controlled atmosphere. For controlled oxidation or blueing, a predetermined quantity of water is admitted automatically into the furnace during a part of the heating cycle.

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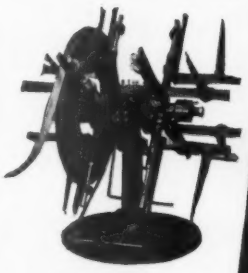

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Vital minutes are saved, with practically no down time for coil replacement, when a Littell Double Reel uncoils stock to the punch press. The idle side of the reel is loaded while the other side pays out. When a coil is used up, the operator simply lifts the hub lock pin, then swivels the reel 180°, thus placing the reserve coil in press feeding position. The change-over is complete in a few seconds. Like Littell Single Reels, Littell Double Reels combine balance that means smooth running accuracy with rugged malleable iron and steel construction that assures year in, year out dependability.

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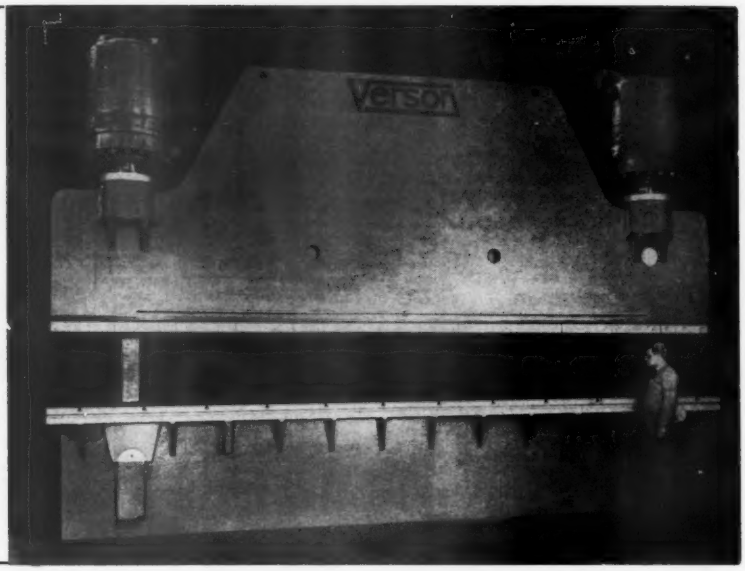

Installation of the largest and greatest capacity hydraulic press brake available for commercial steel fabricating was recently announced by the Republic Structural Iron Works Division of the Consolidated Iron-Steel Mfg. Co., 1290 East 53rd St., Cleveland.

According to Mr. L. S. Cawrse, Consolidated Iron-Steel vice president and manager of the Republic Structural Division, the new press brake has a capacity of 1,000 tons. It bends and forms 1″ plate up to 18′ long and will straighten 6″ plate 18′ long. Mr. Cawrse said that the press brake had been produced by the Verson Allsteel Press Brake Company of Chicago.

The press brake's installation will enable engineers to use the machine's commercial steel fabricating abilities to eliminate many welding operations, to plan weldments instead of castings, and to utilize non-standard sized cylinder and structural shapes.

The press brake is 24′ long and stands 15′ high from the floor with 6′ embedded in a huge reinforced concrete foundation. Its total weight is approximately 150 tons.

An idea of the economies made possible by the new installation is found in the example of the time and labor saved on a simple 90° bend with 1″ plate, 18′ long, as against cutting the plate, clamping the two parts in position, tack welding and then final welding.

Capacity	1000 tons
Distance between housings	18′ 6″
Length of bed and ram	24′
Shut height, bed to ram, stroke down	16″
Daylight space, bed to ram, stroke up	28″
Stroke	12″
Center of ram to back of gap	16″
Area of bed	24″ x 24′

OPERATING SPEEDS:

Differential advance (450 tons)	42″/m
Advance (1,000 tons)	21″/m
Return	42″/m

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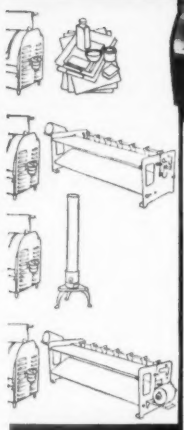

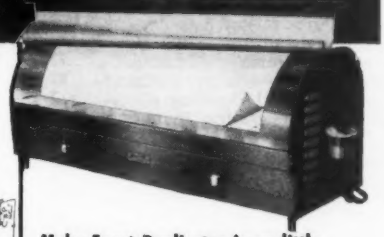

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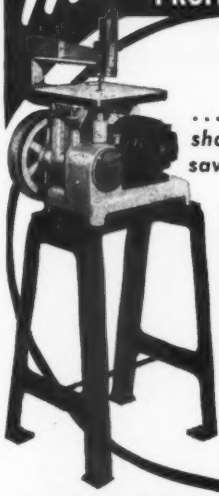

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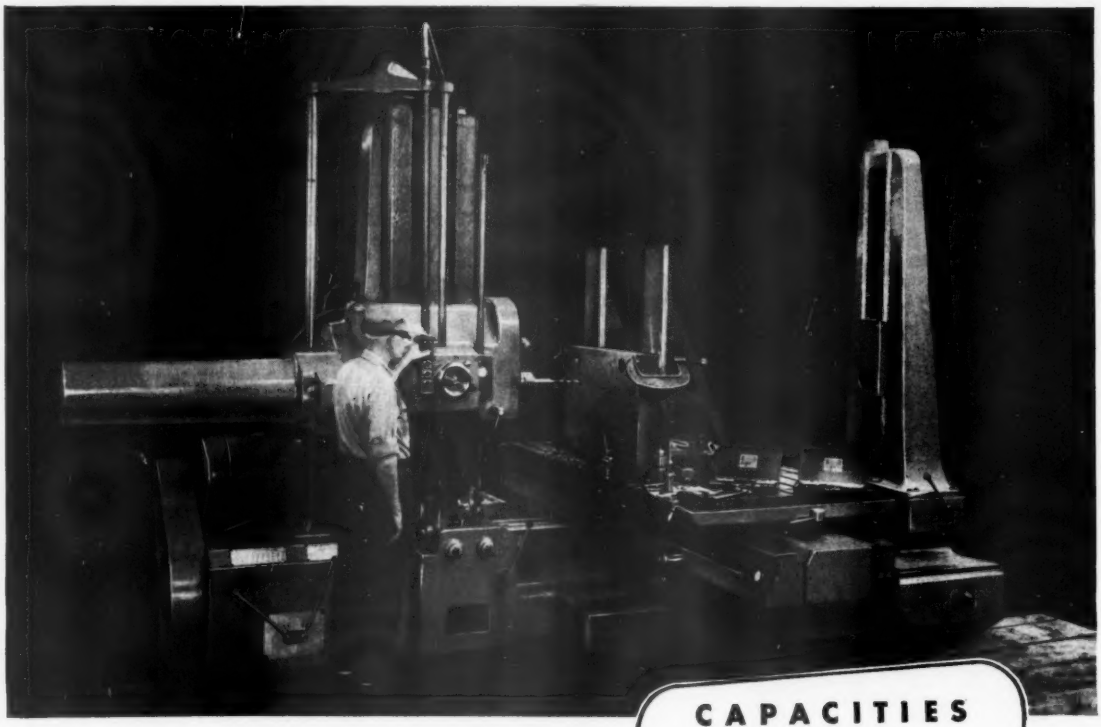

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